AN OVERVIEW OF THE FEDERAL R&D BUDGET FOR FISCAL YEAR 2005

HEARING

BEFORE THE

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED EIGHTH CONGRESS

SECOND SESSION

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February 11, 2004

AN OVERVIEW OF THE FEDERAL R&D BUDGET FOR FISCAL YEAR 2005

WEDNESDAY, FEBRUARY 11, 2004

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
Washington, DC.

The Committee met, pursuant to call, at 11:05 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood L. Boehlert (Chairman of the Committee) presiding.

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

An Overview of the Federal R&D Budget for Fiscal Year 2005

Wednesday, February 11, 2004
11:00 a.m.– 1:00 p.m.
2318 Rayburn House Office Building (WEBCAST)

Witness List

Dr. John H. Marburger III
Director
Office of Science and Technology Policy

Dr. Rita R. Colwell
Director
National Science Foundation

Dr. Charles E. McQueary
Under Secretary for Science and Technology
Department of Homeland Security

Mr. Phillip J. Bond
Under Secretary of Commerce for Technology
Department of Commerce

Dr. Raymond L. Orbach
Director, Office of Science
Department of Energy

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HEARING CHARTER

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

An Overview of the Federal R&D Budget for Fiscal Year 2005

WEDNESDAY, FEBRUARY 11, 2004
11:00 A.M.—1:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Wednesday, February 11, 2004, the House Science Committee will hold a hearing to consider President Bush's fiscal year 2005 (FY05) budget request for research and development (R&D). Five Administration witnesses will review the proposed budget in the context of the President's overall priorities in science and technology. The Science Committee will hold a separate hearing on February 12th to examine the budget request for the National Aeronautics and Space Administration (NASA). Later this year, the Environment, Technology, and Standards Subcommittee will hold a hearing to review the R&D budget of the Environmental Protection Agency (EPA).

2. Witnesses

Dr. John H. Marburger III is the Director of the Office of Science and Technology Policy (OSTP), the White House science office. Prior to joining OSTP, Dr. Marburger served as President of the State University of New York at Stony Brook and as Director of the Brookhaven National Laboratory.

Dr. Rita R. Colwell is the Director of the National Science Foundation (NSF). Before joining the Foundation, Dr. Colwell served as President of the University of Maryland Biotechnology Institute and Professor of Microbiology at the University of Maryland. She was also a member of the National Science Board from 1984 to 1990.

Dr. Charles E. McQueary is the Under Secretary for Science and Technology (S&T) at the Department of Homeland Security (DHS). Prior to joining the Department, Dr. McQueary served as President of General Dynamics Advanced Technology systems, and as President and Vice President of business units for AT&T, Lucent Technologies, and as a Director for AT&T Bell Laboratories.

Mr. Phillip J. Bond is the Under Secretary for Technology in the Department of Commerce. Before joining the Department, Mr. Bond served as Director of Federal Public Policy for the Hewlett-Packard Company, and previously served as Senior Vice President for Government Affairs and Treasurer of the Information Technology Industry Council.

Dr. Raymond L. Orbach is the Director of the Office of Science at the Department of Energy (DOE). Prior to joining the Department, Dr. Orbach was Chancellor of the University of California at Riverside.

3. Background

Overall Budget

On February 2, 2004, President Bush delivered his FY05 federal budget submission to Congress. The budget proposes $2.4 trillion in outlays (versus an estimated $2.0 trillion in receipts), a 3.4 percent increase over FY04, and an estimated 19.9 percent of the $12 trillion U.S. gross domestic product. The overall budget request focuses heavily on Department of Defense (DOD) and Department of Homeland Security (DHS) activities, which receive seven and ten percent increases, respectively. All other discretionary spending is held to 0.5 percent growth.

Research and Development Budget

The President's R&D budget proposes to spend $132 billion, an increase of $5.9 billion, or five percent, over FY04.[1] Consistent with the overall federal budget, the largest percentage R&D increases will go to DOD and DHS (7 and 15 percent, respectively), while all other agencies receive an average increase of 2.3 percent (Table 9). The R&D budget increases are almost entirely for development (eight percent), while basic and applied research are almost flat-funded (0.6 and 0.5 percent increases, respectively).

Research Budget

The Federal Science and Technology (FS&T) budget—which differs from the R&D budget in that it excludes funding for defense development, testing, and evaluation—often provides a more useful overall perspective on funding for agencies under the Science Committee's jurisdiction. Funding for FS&T in the FY05 budget declines by 0.4 percent, to $60.4 billion. The FS&T budgets of the Department of Commerce (DOC) and EPA are particularly affected, receiving 12 and 14 percent cuts, respectively.

Administration Highlights and Perspective

The Administration points out that, under the proposed budget, R&D overall and the research budgets of some key agencies, such as the National Science Foundation (NSF) would increase at a rate significantly greater than overall domestic discretionary spending. But basic and applied research as a whole would grow at about the same rate as the rest of the discretionary budget.

The Administration also argues that the proposed R&D budget should be compared not just to the figures for FY04, but to previous years to get a true picture of how R&D is faring. For example, the budget notes that in FY05, 13.5 percent of all discretionary outlays will go to R&D, the highest share in 37 years. The budget also emphasizes that non-defense R&D outlays are at their third highest level in 25 years. Similarly, the budget underscores that funding for total R&D and civilian R&D have increased 44 and 26 percent since FY01, respectively.

In evaluating the budget using FY01 as a baseline, it should be noted that the overall R&D increases are often not representative of trends for individual agencies and scientific disciplines (and that the figures include development funding). For example, R&D at the National Institutes of Health (NIH) and DHS accounts for over two-thirds of the civilian R&D increases over the last four years, while trends at other agencies range from modest increases to significant cuts.

The Administration also emphasizes that evaluations of how well agencies and programs are managed is helping to determine the proposed budgets. Agencies are evaluated by the Executive Branch Management Scorecard, which grades agencies with green, yellow and red lights. Agencies under Science Committee jurisdiction generally scored well on these evaluations, in particular NASA and NSF, which were the only agencies among the 26 evaluated to receive more than one green light. The Office of Management Budget selects a number of specific programs to review each year using the Program Assessment Rating Tool (PART). Some R&D programs at both the Department of Energy (DOE) and the EPA receive cuts in the FY05 proposal because of poor PART scores. NSF programs have scored well.

The budget also emphasizes the Administration's growing concern over Congressional earmarks within R&D accounts. The budget notes that academic earmarks have increased from just $296 million in 1996 to over $2 billion in 2003, and that they now account for eight percent of all federal funding to colleges and universities.

4. Primary Issues

The following highlights flag those areas of greatest interest to the Science Committee:

Overall Funding Levels and Balance: The research community (often backed by the Science Committee and the federal agencies themselves) has been calling for substantial increases in R&D. For example, the Congress passed, and the President signed, the NSF Authorization Act, which calls for doubling NSF's budget over five years. The proposed budget falls significantly short over those goals because overall domestic discretionary spending is so tight. The increase for non-defense, non-homeland security R&D in the proposed budget is 2.3 percent. Further, research (basic and applied) is essentially flat-funded while support for development is increased eight percent (Table 9). Also, while the Committee will review the NASA budget request at a later date, the proposed increase for NASA (5.6 percent) may have an

[1] A complete federal R&D spending table is provided at the end of the charter.

impact on the availability of R&D funds for other agencies—especially NSF and EPA, which are both included in the same appropriations bill as NASA (VA-HUD-Independent Agencies Appropriations).

Physical Science Research: The FY05 budget request would continue the decade-long trend of flat-funding physical science research. For example, the budget requests $3.42 billion for the Department of Energy's (DOE) Office of Science—the largest single source of funds for civilian physical science research—a decrease of $68 million (two percent). Even if Congressional earmarks were excluded from the FY04 baseline (as the Administration suggests is appropriate), the requested increase for the Office of Science would only amount to two percent. In constant dollars, physical science research is funded at about the same level as in 1993, while biological research has more than doubled.

NSF Math and Science Partnership Program: The budget would eliminate the Math and Science Partnership (MSP) program at NSF ($140 million enacted in FY04). MSP, which funds partnerships between local school districts and institutions of higher education to improve K–12 math and science education, was established in the *National Science Foundation Act of 2002* (P.L. 107–368), following the recommendation of the President. After highlighting MSP in the FY03 and FY04 budget requests for NSF, the Administration has proposed moving the program and its funds to the Department of Education. Opponents of the move believe NSF is better suited to run a competitive program that pairs universities with school districts. If moved, the NSF program would be merged with a Department of Education program that focuses exclusively on mathematics for secondary school students, particularly those who are at risk of dropping out of high school because they lack basic skills. Also, by law, the Department of Education program is distributed to states by formula. As part of its proposal, the Administration wants Congress to amend the law so that the Department could award funds competitively—as NSF already does.

National Institute of Standards and Technology (NIST): Overall, NIST receives a 14.5 percent decrease in the FY05 budget request, primarily due to elimination of the Advanced Technology Program (ATP). ATP has long been a contentious program because it assists industrial research. The budget requests a 22 percent increase over the FY04 for NIST's core laboratories, but some of that money is needed to restore funding cut by Congress in FY04. NIST has not yet provided a final assessment of the impact of those cuts, but it has estimated that 50 to 100 scientists and technical staff may be laid off during the current fiscal year, and work at all labs will be reduced.

NIST Manufacturing Extension Partnership (MEP): The FY05 budget requests no increase for the Manufacturing Extension Partnership (MEP), which was cut 67 percent in the FY04 enacted budget. The dramatic reduction in MEP funding for the current fiscal year likely will result the closure of a significant number of MEP centers and satellite offices that provide assistance to small manufacturers to improve their competitive position.

5. Interagency Research Activities

National Nanotechnology Initiative (NNI): NNI, which involves ten federal agencies, continues to be a high priority of both the Administration and the Science Committee. The budget requests an estimated[2] $982 million for NNI in FY05, an increase of $21 million, or two percent, over the estimated FY04 level. Funding for the five agencies[3] authorized in the *21st Century Nanotechnology Research and Development Act* (P.L. 108–153) is up eight percent to $609 million, but remains significantly below the $809 million authorized for FY05 in the Act.

Networking and Information Technology R&D Initiative (NITRD): NITRD, which has been in existence for many more years than NNI, did not receive an increase. The budget requests $2.0 billion for NITRD in FY05, a one percent decrease from the FY04 enacted level.

Climate Change Research: The budget requests $2 billion for the interagency Climate Change Science Program (CCSP), approximately the same as enacted in FY04.

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[2] OMB and OSTP estimate agency funding levels for NNI activities, but the data are not entirely consistent from year to year and there are discrepancies arising from the fact that some nanotechnology research may be difficult to identify or classify.

[3] The National Science Foundation, the Department of Energy, the National Institute of Standards and Technology, the National Aeronautics and Space Administration, and the Environmental Protection Agency.

A strategic plan for CCSP was released in July 2003, but it is unclear to what extent the budget request was guided by that strategic plan. The request for CCSP includes $240 million for the interagency Climate Change Research Initiative (CCRI), a 42 percent increase above the FY04 enacted level. CCRI is intended to target critical scientific uncertainties and deliver results in three to five years. It is unclear, however, how much of the increase for CCRI reflects reprogramming from ongoing research activities in other programs.

Cyber Security R&D: Some increases are proposed for cyber security R&D programs in FY05. The budget requests $76 million for cyber security R&D and education and training programs at NSF and $18.5 million for cyber security R&D at NIST (up 48 percent). These are both significant increases but still well below the levels authorized in the *Cyber Security Research and Development Act* (P.L. 107–305).[4] Within the DHS Science and Technology (S&T) Directorate, the FY05 budget requests $18 million for cyber security R&D, the same level as in FY04.

The National Earthquake Hazards Reduction Program (NEHRP): NEHRP is a multi-agency program administered by the Federal Emergency Management Agency (FEMA), U.S. Geological Survey (USGS), NIST, and NSF. The President's overall FY05 request for NEHRP is $114.5 million, including $45.7, $46.5, $20.5, and $1.8 million, respectively, for NSF, USGS, FEMA, and NIST. These amounts are roughly flat compared to FY04 levels. The House passed a reauthorization bill for NEHRP last year, which is pending in the Senate.

Budget tables for NNI, NITRD, and CCSP are provided in Appendix I.

6. Agency R&D Highlights

National Science Foundation (NSF)

The National Science Foundation is the primary source of federal funding for nonmedical basic research conducted at colleges and universities and serves as a catalyst for science, technology, engineering, and mathematics education reform at all levels.

The FY05 budget request for NSF is $5.75 billion, an increase of 3.0 percent, or $167 million over the FY04 level. This is $1.6 billion below the funding level in the *National Science Foundation Authorization Act of 2002* (P.L. 107–368). In the budget proposal, the largest percentage increases are for personnel and administrative initiatives, as well as construction of major research facilities. The Research and Related Activities (RRA) account, which contains the funds for most of NSF research grants programs, receives a 4.7 percent increase. However, actual spending on research programs would increase by only 2.8 percent because the Administration transfers into the research account funds that would be used to close out a discontinued education program.

NSF continues to receive high marks from the Office of Management and Budget for the quality of its management and for the excellence of its programs. As in the FY04 budget request, NSF was awarded two green lights on the Executive Branch Management Scorecard. Also, in the past year, four NSF programs were examined using the Program Assessment Rating Tool (PART): Nanoscale Science and Engineering, Information Technology Research, Facilities, and Individuals (programs directed toward math, science, and engineering education and training of students at the K–12, undergraduate, and graduate levels). All received ratings of Effective (the highest rating), and the three continuing programs received substantial budget increases.[5]

Issues/Questions Raised by the FY05 Request for NSF

Education and Human Resources (EHR): In addition to eliminating the MSP program as discussed above, the FY05 budget request would cut other NSF education programs at the K–12 and undergraduate levels. For example, the Science, Mathematics, Engineering, and Technology Talent Expansion Program (known as STEP or the Tech Talent program) established in the *National Science Foundation Authorization Act of 2002* (P.L. 107–368) would receive $15 million in FY05, a decrease of $9.85 million (40 percent) from the FY04 enacted level of $24.85 million. Tech Talent funds innovative programs at colleges and universities designed to increase the number of American undergraduates completing degrees in math,

[4] For FY05, NSF cyber security programs are authorized to be $128 million and NIST cyber security programs are authorized to be $61 million.

[5] Nanoscale Science and Engineering is up 22 percent, Facilities is up 12 percent, and the "Individuals" category (programs focused on education and training) is up 11 percent. (All percentages compare the FY05 request with the FY04 enacted level.) The Information Technology Research program will be terminated in FY04, as scheduled.

science, and engineering. The Robert Noyce Scholarship Program, which was re-authorized in the 2002 Act, would receive $4 million in FY05, a decrease of $3.95 million (50 percent) from the FY04 enacted level of $7.95 million. The program offers scholarships to math and science majors at the junior and senior undergraduate level, and stipends to math and science professionals, who are seeking to become K–12 math and science teachers.

Major Research Equipment and Facilities Construction (MREFC): The FY05 budget request proposes $213.27 million for this account, 37 percent above the FY04 level. The request includes three continuing projects and three new starts: National Ecological Observatory Network (NEON), Scientific Ocean Drilling Vessel (SODV), and Rare Symmetry Violating Processes (RSVP). The budget does not provide the rationale for starting these three projects from among those in the queue.

Organization and Management: Nearly half of the $167 million increase requested for NSF in FY05 is slated for the Salaries and Expenses (S&E) account. The FY05 budget requests $294 million for S&E, an increase of $75 million (34 percent) over the FY04 enacted level of $219 million. Most of the proposed increase for S&E—$47.1 million—would be used to buy or lease new computer and networking equipment and services. The budget does not explain the reason for the large increase. The budget does not request significant new funds for personnel, although staffing has not kept up with the increases in the number of grants being awarded, and the Inspector General has raised concerns about NSF's ability to manage grants with its existing staff.

Table 1. National Science Foundation
FY05 Budget Request (dollars in millions)
(Source: Agency Budget Justification)

Account	FY03 Actual	FY04 Enacted	FY05 Request	Amount Change	Percent Change
RRA	4054.4	4251.4	**4452.3**	201.0	4.7%
BIO	570.5	586.9	599.9	13.0	2.2%
CISE	589.3	604.7	618.1	13.4	2.2%
ENG	541.7	565.1	575.9	10.8	1.9%
GEO	691.8	713.1	728.5	15.4	2.2%
MPS	1040.7	1091.5	1115.5	24.0	2.2%
SBE	158.6	175.7	190.7	15.0	8.5%
OISE	40.0	28.1	34.0	5.9	21.1%
OPP	324.0	342.2	349.7	7.6	2.2%
IA*	97.9	144.1	240.0	95.9	66.5%
EHR	903.2	939.0	**771.4**	-167.6	-17.9%
MRE	148.5	155.0	**213.3**	58.3	37.6%
S&E	189.1	218.7	**294.0**	75.3	34.4%
OIG	9.2	9.9	**10.1**	0.17	1.7%
NSB	3.5	3.9	**4.0**	0.07	1.8%
Total	**5308**	**5578**	**5745**	**167.2**	**3.0%**

Acronyms:

RRA = Research and Related Activities

EHR = Education and Human Resources

MREFC = Major Research Equipment and Facilities Construction

S&E = Salaries & Expenses

OIG = Office of Inspector General

NSB = National Science Board

BIO = Biological Sciences

CISE = Computer & Information Science & Engineering

ENG = Engineering

GEO = Geosciences

MPS = Mathematical and Physical Sciences

SBE = Social, Behavioral, and Economic Sciences

OISE = Office of International Science & Engineering

OPP = Office of Polar Programs

*IA = Integrative Activities (increase due to redirection of Math and Science Partnership program from EHR)

Homeland Security R&D

Homeland Security R&D at the Department of Homeland Security (DHS)

The budget requests $1.2 billion for R&D in DHS, a 15 percent increase over the FY04 enacted level. The primary focus of the DHS effort would continue to be on development ($750 million, or 62 percent of the total DHS R&D FY05 request), but

the budget does propose a significant increase in funding devoted to basic research ($153 million, up $106 million from FY04).

Although R&D is also funded in other directorates, the bulk of the department's proposed R&D expenditures, about $1 billion, is requested for the DHS Science and Technology (S&T) Directorate, an increase of $126 million (14 percent) over the FY04 enacted level. Most of this increase is directed toward biological countermeasures activities, including an expansion of BioWatch[6] coverage in high-threat cities, piloting an integrated warning and assessment system for bioattacks, and safety/compliance and security upgrades to the infrastructure of the Plum Island Animal Disease Center.

The FY05 budget request proposes to commence consolidation of the department's R&D programs into the S&T Directorate by transferring of $24 million worth of R&D activities from the U.S. Coast Guard and from the Federal Air Marshal Service. Significant R&D programs would remain outside of the S&T Directorate, mainly the $154 million R&D program in the Transportation Security Administration.[7]

S&T Directorate funding is split among various technical portfolio areas, such as biological countermeasures, nuclear and radiological countermeasures, support of conventional DHS missions (such as the Secret Service), and threat and vulnerability testing and assessment (TVTA); a complete list of portfolios and their funding is provided in Table 2. Cyber security R&D, an element of TVTA, would receive $18 million (the same level as in FY04).[8]

Homeland Security R&D at Other Agencies

Approximately $2.4 billion is proposed for homeland security R&D programs in departments and agencies outside of DHS. The bulk of this funding, $1.7 billion (up 7.5 percent from FY04), is for biodefense programs at the NIH, such as basic research on infectious microbial agents, applied research on diagnostics, vaccines, and therapies, and construction of bio-safety facilities. The remaining funds (approximately $700 million) go to a number of other agencies, such as: EPA for research on detection of chemical and biological agents in the water supply (other homeland security R&D activities at EPA are cut, so this item may be controversial); the U.S. Department of Agriculture (USDA) for expanding the Nation's laboratory capabilities for animal disease diagnosis and research; DOD for detection systems, protective gear, and vaccines for biological and chemical agents; and DOE's National Nuclear Security Administration for research on detection and attribution of radiological and nuclear materials.

In its first year of existence, the DHS S&T Directorate has begun to build relationships with other agencies and some successful coordination of projects has occurred. For example, DHS and NSF provided joint funding for a cyber security test bed, and DHS and NIST worked together on issuing standards for first responders' equipment.

Issues/Questions Raised by the FY05 Request for DHS

Balance Between Internal and External Programs within the S&T Directorate: The Science Committee is interested in the balance between R&D conducted within the Department and at national laboratories,[9] and extramural R&D funded through a competitive, merit-reviewed grant process. The balance is not discernible in the FY05 budget request. The request for DHS S&T presents proposed funding levels by technical topic, not by organizational unit or research performer. No information is provided about how these funds will be expended—whether through programs at the national laboratories, grants to industry and others through Homeland Security Advanced Research Projects Agency (HSARPA), or through contracts for prototype development.

Transitioning Technology from Development to Operations: The DHS S&T Directorate has responsibility for the full range of R&D, from basic research through

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[6] BioWatch is a system of sensors in various cities that is designed to rapidly detect trace amounts of biological materials in the air so as to provide early warning of the release of a bioagent.

[7] The *Homeland Security Act of 2002,* which created DHS, requires the Transportation Security Administration to be maintained as a distinct entity through November 25, 2004.

[8] At DHS, operational cyber security programs, such as national alerts about existing computer and network vulnerabilities and technical support for other federal agencies' implementation of cyber security activities, are located in the National Cyber Security Division of the Information Analysis and Infrastructure Protection Directorate, for which roughly $79 million (level funding) has been requested for FY05.

[9] National laboratories available for use by the DHS S&T Directorate include the DOE laboratories, the National Biodefense Analysis and Countermeasures Center, and the Plum Island Animal Disease Center.

prototype demonstrations. In order for the directorate to devote resources to all elements of the R&D process, successful technologies will have to be passed off to operational units within DHS or elsewhere. It is not clear, however, that the Directorate has a process in place to effect such transitions.

Table 2. DHS Science and Technology Directorate

FY 2005 Budget Request (dollars in millions)
(Source: Agency Budget Justification)

Account	FY03 Actual	FY04 Enacted	FY05 Request	Amount Change	Percent Change
Biological Countermeasures (including NBACC, BioWatch, and Plum Island)#	NA	285.0	407.0	122.0	42.8%
Nuclear and Radiological Countermeasures	NA	126.3	129.3	3.0	2.4%
Chemical Countermeasures	NA	52.0	53.0	1.0	1.9%
High Explosives Countermeasures	NA	9.5	9.7	0.2	2.1%
TVTA (including CIP and Cybersecurity*)	NA	100.1	101.9	1.8	1.8%
ManPADS	NA	60.0	61.0	1.0	1.7%
Support of DHS Conventional Missions	NA	34.0	34.0	0.0	0.0%
Rapid Prototyping Program/TSWG	NA	73.0	76.0	3.0	4.1%
Standards/State and Local Programs	NA	39.0	39.7	0.7	1.8%
Emerging Threats	NA	21.0	21.0	0.0	0.0%
University Centers and Fellowship Programs	NA	68.8	30.0	-38.8	-56.4%
Transferred R&D Programs**		0.0	24.2	24.2	NA
Administration/Salaries	NA	44.2	52.6	8.3	18.9%
Total	**561.0**	**912.9**	**1039.3**	**126.4**	**13.8%**

Acronyms:
NBACC = National Biodefense Analysis and Countermeasures Center
TVTA = Threat and Vulnerability, Testing and Assessment
TSWG = Technical Support Working Group
CIP = Critical infrastructure protection
RDT&E = Research, Development, Test, and Evaluation

Increase to Biological Countermeasures (~$120M) is mainly due to increases in Bio-Surveillance activities (+$65M) and Plum Island Animal Disease Center (+$12.9M).

* Cybersecurity is at $18.0 M in both FY04 and FY05.

** Programs transferred into DHS S&T from elsewhere in DHS include:
Coast Guard RDT&E Activities ($13.5 M)
U.S. Fire Administration RDT&E Activities ($0.65 M)
Federal Air Marshal Service RDT&E Activities ($10 M)

National Institute of Standards and Technology (NIST)

NIST's Laboratory Programs

The FY05 budget requests $422 million for a wide range of research conducted at NIST laboratories in Gaithersburg, Maryland and Boulder, Colorado. The request is $85 million (22 percent) above the FY04 enacted level of $337 million. This request is less of a jump than it initially appears. Congress cut the NIST laboratory programs by $22 million in FY04, so some of the increase is needed simply to restore NIST to its former level. Another $25.7 million of the increase is for one-time expenses at the new Advanced Measurement Laboratory (see below). Another NIST has not provided a final assessment of the impacts of the FY04 appropriation, but it has estimated that 50 to 100 scientists and technical staff may be laid off, and work at all labs will be reduced.

Cyber Security

The FY05 budget requests $18.5 million for cyber security R&D at NIST, an increase of $6 million (48 percent) over the FY04 enacted level. With the additional funding, NIST would work with industry and government agencies to accelerate the development of more secure computer and communications infrastructure, and expand and develop stronger cryptographic standards for hand-held wireless technology.

Advanced Measurement Laboratory Equipment

The Advanced Measurement Laboratory in Gaithersburg, Maryland is scheduled for completion this year. The requested increase for NIST's laboratory programs includes $25.5 million (non-recurring) to outfit the Advanced Measurement Laboratory with state-of-the-art metrology equipment required to maximize the usefulness of this facility. The ability of NIST to perform other research proposed for FY05, including that which would be funded by the President's requested $12 million increase for nanomanufacturing and nanometrology, will depend on the timely outfitting of this laboratory.

Advanced Technology Program (ATP) and Manufacturing Extension Partnership (MEP)

Both ATP and MEP are largely extramural (outside of the laboratories) grant programs administered by NIST. The goal of ATP is to provide grants in to "bridge the gap between the research laboratory and the marketplace" through grants to the private sector. ATP seeks to fund development of pre-competitive, emerging, and high-risk technologies that promise significant benefit. MEP funds state and regional centers that help small U.S. manufacturers adopt advanced manufacturing technologies, techniques, and best business practices.

The President's FY05 budget proposes to eliminate ATP. (The FY04 enacted level for ATP is $179 million.) Unlike previous proposals to eliminate ATP, this budget provides no money for close-out costs, which include funds for completing multi-year awards made in previous years and continuing funding for internal NIST laboratory work related to ATP proposals.

The request for MEP is $39 million, equal to the FY04 enacted level, which represents a 67 percent cut from the FY03 enacted level of $106 million. The dramatic reduction in MEP funding enacted for FY04 is expected to lead to the closure of a significant number of regional MEP centers. There are currently 60 MEP centers and 300 satellite offices.

Issues/Questions Raised by the FY05 Request for NIST

Impact of FY04 Enacted Budget on NIST's Core Laboratory Programs: NIST has not resolved how to implement the significant funding reductions for its core laboratory programs that were included in the FY04 enacted budget, including possible lay-offs and program reductions. It is not clear how these reductions will affect NIST's ability to undertake the new initiatives proposed in the FY05 budget request.

Impact of Proposed Elimination of ATP: The FY05 budget request proposes to eliminate ATP, but provides no funds to close out obligations incurred through multi-year ATP awards granted during the current fiscal year. These costs could be as high as $30 million. Moreover, ATP is expected to fund an estimated $13 million worth of R&D conducted at the NIST laboratories in FY04.

Impact of Scaling Back MEP: It is unclear how the MEP program would function at the levels proposed by the Administration. The Administration has already proposed to re-compete all centers, but it is unclear what criteria will be used, how many centers will be continued or created, or how they will be organized.

Table 3. National Institute of Standards and Technology
FY 2005 Budget Request (dollars in millions)
(Source: Agency Budget Justification)

Account	FY 03 Enacted	FY 04 Enacted	FY 05 Request	Amount Change	Percent Change
STRS	**357.1**	**344.4**	**422.9**	**78.5**	**22.8%**
EEE	45.4	44.7	55.8	11.1	24.8%
ME	21.0	21.8	29.6	7.8	35.7%
CST	40.1	42.3	50.1	7.8	18.5%
Physics	35.3	37.7	42.2	4.6	12.1%
MSE	56.2	53.0	62.7	9.7	18.3%
BFR	21.4	21.5	23.6	2.1	9.5%
CSAM	52.7	49.5	57.9	8.4	16.9%
TA	17.6	15.0	17.4	2.4	16.3%
NQP	5.2	5.7	5.4	-0.3	-4.5%
RS	62.3	53.2	78.1	24.9	46.8%
ITS	**284.8**	**218.8**	**39.2**	**-179.6**	**-82.1%**
ATP	178.8	179.2	0.0	-179.2	-100.0%
MEP	105.9	39.6	39.2	-0.4	-1.1%
Construction	**65.7**	**65.0**	**59.4**	**-5.5**	**-8.5%**
TOTAL	**423.1**	**628.1**	**521.5**	**-106.6**	**-17.0%**

Acronyms:
STRS = Scientific and Technical Research Services
EEE = Electronics and Electrical Engineering
ME = Manufacturing Engineering
CST = Chemical Science and Technology
Phys = Physics
MSE = Materials Science and Engineering
BFR = Building and Fire Research
CSAM = Computer Science and Applied Mathematics
TA = Technology Assistance
NQP = National Quality Program
RS = Research Support
ITS = Industrial Technology Service
ATP = Advanced Technology Program
MEP = Manufacturing Extension Partnership

National Oceanic and Atmospheric Administration (NOAA)

The FY05 budget requests $3.4 billion for NOAA, a decrease of $308 million (8.3 percent) compared to the FY04 enacted level of $3.7 billion. NOAA's FY04 budget includes approximately $540 million worth of Congressional earmarks. If earmarks are removed from the FY04 baseline, then the President's budget could be construed as proposing an additional $230 million for NOAA in FY05.

National Weather Service

The FY05 budget requests $837 million for the National Weather Service (NWS), an increase of $12 million (1.5 percent). The request reflects the transfer of two programs from the Office of Oceanic and Atmospheric Research (OAR) to NWS—the Space Environment Center ($7.5 million request) and the U.S. Weather Research Program ($6.6 million request). NOAA's request for the Space Environment Center is an increase of $2.2 million over the FY04 enacted level of $5.3 million. The Subcommittee on Environment, Technology, and Standards held a hearing last year on the activities of the Center (which predicts the effects of solar storms) that helped establish the value of the Center to the Nation.

Climate Change Research

The FY05 budget request includes a $13.5 million increase in climate change research and observations at NOAA. Most of the increase is to support the President's Climate Change Research Initiative (CCRI), which focuses on priority areas, such as ocean observations ($11 million), aerosol research ($7 million), and carbon cycle research ($6.5 million).

Satellite Acquisition

The FY05 budget requests $898 million for satellite programs at NOAA. This request is a $71 million (8.6 percent) increase over the FY04 enacted level of $827 million. The increase is for procurement, acquisition, and construction of the next generation of weather satellites, and is in line with the long-term budget plans for these satellite systems. Polar weather satellites are vital for three- to seven-day weather forecasts, tracking of severe weather such as hurricanes, and for climate observations. In September 2003, the last of the current generation of polar satellites was severely damaged in an accident during construction. Unless this satellite can be repaired or replaced, there will be gap in polar weather satellite coverage of at least 21 months (the time until the next generation polar satellite is scheduled to be launched). A report assessing whether the satellite can be repaired and the costs associated with that repair is scheduled to be released in April.

Issues/Questions Raised by the FY05 Request for NOAA

Weather Satellite Coverage Gap: The Committee is concerned that the costs of repairing or replacing the satellite that was damaged during construction last year is not included in the FY05 request. If the satellite cannot be repaired and funding levels for the next generation is not increased significantly, there will be a gap in polar satellite coverage at the end of this decade. The current projection for the cost of the next generation polar satellite system has risen from $6.5 billion to $7.4 billion, without taking into account the recent accident. The Committee has asked the General Accounting Office (GAO) to examine the costs and risks associated with NOAA's satellite program.

Organization of Research at NOAA: In the legislative reports accompanying the FY04 Commerce, State, Justice appropriations bills in the House and Senate, NOAA was asked to examine its research enterprise and deliver a report on (1) the costs and benefits of dissolving Office of Oceanic and Atmospheric Research (OAR) and distributing its activities among the other program offices, and (2) a plan for consolidating its laboratories. NOAA quickly assembled a subcommittee of its Science Advisory Board to examine the issue. The subcommittee provided its observations and recommendations to NOAA in January 2004. It appears that based on this review process, NOAA moved programs from OAR to NWS in the FY05 request. The Committee is concerned that NOAA is beginning to implement major structural changes to its research enterprise without fully examining the ramifications or consulting with the authorizing committees.

Table 4. National Oceanic & Atmospheric Administration
FY 2005 Budget Request (dollars in millions)
(Source: Departmental Budget Justification)

Account	FY03 Actual	FY04 Enacted	FY05 Request	Amount Change	Percent Change
NOS	485	606	**394**	-212	-35.0%
ORF	415	506	379	-127	-25.1%
PAC	70	100	15	-85	-85.0%
OAR	389	414	**361**	-53	-12.8%
ORF	372	393	350	-43	-10.9%
PAC	17	21	11	-10	-47.6%
NWS	746	825	**837**	12	1.5%
ORF	702	722	749	27	3.7%
PAC	44	103	88	-15	-14.6%
NESDIS	640	827	**898**	71	8.6%
ORF	149	152	149	-3	-2.0%
PAC	491	675	749	74	11.0%
Program Support[1]	253	363	**277**	-86	-23.7%
ORF	169	323	240	-83	-25.7%
PAC	84	40	37	-3	-7.5%
NMFS	603	760	**735**	-25	-3.3%
Transfers	14	-106	**-121**	-15	N/A
Total	**3,130**	**3,689**	**3,381**	**-308**	**-8.3%**

NOS = National Ocean Service, which manages the nation's coastal and ocean ecosystems.

OAR = Office of Oceanic and Atmospheric Research, which conducts research, in weather, climate, coastal, ocean and Great Lakes, and living marine resources topics.

NWS = National Weather Service

NESDIS = National Environmental Satellite Data Information Service, which acquires and manages the Nation's operational weather satellites and satellite data.

[1]Program Support includes Fleet and Aircraft Maintenance and NOAA headquarters accounts.

NMFS = National Marine Fisheries Service, which is budgeted under NOAA, but is under jurisdiction of the Resources Committee.

ORF = Operations, Research and Facilities

PAC = procurement, Acquisition and Construction

Department of Energy (DOE)

The FY05 request for civilian R&D at DOE—$5.0 billion—represents a decrease of four percent from FY04 enacted levels.[10] The Administration's top funding priorities for energy and science programs are hydrogen R&D, fusion, nanotechnology, and the programs of the Office of Electric Transmission and Distribution.

[10] Unlike the Administration's Federal Science and Technology Funding Table 5–3 on page 61 of *Analytical Perspectives,* these figures include the $140 million rescission from the Clean Coal Technology Account.

Office of Science

The FY05 budget requests $3.43 billion for the Office of Science, a decrease of $68 million (two percent) from the FY04 enacted level. The Administration describes this as a two percent increase, if one excludes Congressional earmarks from the FY04 baseline. The budget is far below the $.1 billion level authorized in H.R. 6, the *Energy Policy Act of 2003,* which the House passed last year.

The budget request includes funds to begin planning and construction of several major new facilities, such as the Linac Coherent Light Source, a Protein Production and Tags Facility, and the U. S. share of the International Fusion Experimental Reactor (ITER).

The budget requests $264 million for fusion research, an increase of $1.6 million (0.6 percent) from the FY04 enacted level of $263 million, but that increase is not large enough to accommodate U.S. participation in ITER in FY05 without cutting other existing parts of the fusion program.

The FY05 budget request proposes significant decreases in funding for Biological and Environmental Research (BER)—$502 million requested, a decrease of $140 million (22 percent) from the FY04 enacted level of $641 million. Much of the reduction in BER reflects elimination of earmarks or projects that have been completed. The budget also cuts the Science Laboratories Infrastructure account nearly in half—$29 million requested, a decrease of $25 million (46 percent) from the FY04 enacted level of $54 million.

Applied Energy Programs

The budget continues the trend of cutting most energy efficiency and renewable programs to fund hydrogen research and weatherization. Excluding the hydrogen/FreedomCAR activities, efficiency and renewable R&D for FY05 is $656 million, a cut of ten percent ($72 million) from the FY04 enacted level of $727 million.

In fossil energy, the budget increases coal programs by $108 million (60 percent), primarily to fund the FutureGen project, which would build a new coal plant to experiment with the sequestration of carbon dioxide. These increases come at the expense of the stationary fuel cell program (Distributed Generation), cut by $49 million (68 percent), to $23 million; as well as other coal programs. The budget proposes to rescind the funds for several Clean Coal projects that never got off the ground and to close the Clean Coal Technology account, moving most of the money to the base Fossil R&D program. This follows what the appropriators have been doing piecemeal for several years.

Oil and gas programs are also cut: oil technology by 57 percent (−$20 million, to $15 million) and gas technology by 39 percent (−$17 million, to $26 million). These two programs were among the few rated ineffective by OMB using its Program Assessment and Rating Tool (PART).

The new Office of Electric Transmission and Distribution receives a $10 million increase (13 percent, to $91 million), half of which is for R&D programs, and half of which is for program direction for personnel increases. Despite the increased resources, some elements of the Office were cut. Electricity storage R&D, vital to emerging technologies such as wind, fuel cells, and solar-generated electricity, is cut by $5 million (56 percent, to $4 million). (The sister program in EERE—Distributed Energy—cited by witnesses at a September 2003 Energy Subcommittee briefing as being crucial for reliability—is cut by 13 percent (to $53 million)).

In the nuclear area, large increases for Idaho facilities management (up $33 million, 43 percent) come at the expense of nuclear energy R&D, which receives a 26 percent cut (−$34 million, to $96 million) in the budget.

Issues/Questions Raised by the FY05 Request for DOE

Physical Science Research: Funding for the physical sciences has remained essentially flat for at least a decade. The proposed cuts to the Office of Science—the single largest source of federal funds for civilian physical science R&D—continue the pattern even though the Administration had signaled that physical science and engineering research activities would be given additional consideration during the FY05 budget cycle.

Twenty-year Facilities Plan: The Office of Science recently released a 20-year plan for the acquisition and construction of experimental facilities for the physical sciences. That plan was based on the budget numbers contained in H.R. 6, the *Energy Policy Act of 2003.* While the budget proposes to move forward with several of these facilities, including ITER, the Protein Production and Tag Facility and Linac Coherent Light Facility, the budget request for DOE's Office of Science declines in the face of these increasing future facility commitments, raising questions about the ability to meet these long-term goals without reducing existing programs.

Third-Party Financing for Science Infrastructure: The cuts to DOE's Science infrastructure funding run counter to complaints from the scientific community about deteriorating facilities throughout DOE's complex of laboratories. The Administration says that its current plan is to have new facilities built and owned by private entities, with DOE as the tenant. This approach can increase the cost to the government over the life of the building (even though it reduces up-front costs). Third party financing can also create incentives that can distort the activities of government programs to meet the needs of building owners.

Hydrogen R&D: The budget requests a significant increase for R&D on infrastructure for hydrogen as a fuel for transportation, to be offset by cuts in energy efficiency R&D, the area of research that likely has the most rapid payoff in terms of reducing our dependence on imported energy. The recently released National Academies of Science (NAS) study, *The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs,* emphasizes that hydrogen R&D efforts need to be approached in a systems analysis framework to "integrate them with other DOE energy efforts." The report also notes that fuel cell technology necessary for transportation is at least a decade away, and the budget sends conflicting signals, cutting funding for stationary fuel cells and increasing funding for transportation fuel cells and basic research. This report raises additional questions regarding the coordination and execution of this long-term effort.

FutureGen: The budget makes a $237 million commitment to the controversial FutureGen project, which would build a new coal power plant to demonstrate the sequestration of carbon dioxide in geological formations. The Department's plans for the project include cutting-edge equipment throughout the facility, which will both raise the cost and increase the chances of failure. Further, the Administration's proposed legislative language would remove taxpayer protections, such as cost sharing, from the project requirements.

Table 5. Department of Energy Civilian R&D

FY 2005 Budget Request (dollars in millions)
(Sources: President's FY05 Budget Request and Departmental Budget Justification)

Account	FY03 Actual	FY04 Enacted	FY05 Request	Amount Change	Percent Change
Science	3322	3500	3432	-68	-2.0%
HEP	702	734	737	4	0.5%
NP	371	390	401	11	2.9%
BER	494	641	502	-140	-21.8%
BES	1002	1011	1064	53	5.2%
ASCR	163	202	204	2	1.0%
FES	241	263	264	2	0.6%
O(1)	349	260	260	0	-0.1%
FE (2)	564	575	496	-79	-13.7%
FERD	611	673	636	-37	-5.5%
CCT	-47	-98	-140	-42	-42.9%
EERE	934	964	919	-45	-4.7%
RE	322	357	375	18	5.0%
EE	612	607	544	-63	-10.4%
NE (2,3)	130	130	96	-34	-26.2%
ETD	88	81	91	10	12.5%
Total (4)	**5039**	**5250**	**5033**	**-216**	**-4.1%**

(1) Includes Safeguards and Security (less reimbursable work), Workforce Development for Scientists and Teachers and small business set-asides.
(2) R&D programs only
(3) Does not include non-civilian nuclear activities
(4) Reflects adjustments made in PL 108-199 as reflected in H Rept. 108-401

Key to Abbreviations

Science
- HEP — High Energy Physics
- NP — Nuclear Physics
- BER — Biological and Environmental Research
- BES — Basic Energy Sciences
- ASCR — Advanced Scientific Computing Research
- FES — Fusion Energy Science
- O — Other Science Programs

FE — Office of Fossil Energy
- FERD — Fossil Energy Research and Development Account
- CCT — Clean Coal Technology Account

EERE — Office of Fossil Energy
- RE — Renewable Energy (in Energy Supply account)
- EE — Energy Efficiency in Energy Conservation account

NE — Nuclear Energy Science and Technology (in Energy Supply account)

ETD — Electric Transmission and Distribution

7. Witnesses Questions

Witnesses have been asked to:

1. Review the R&D budget request in the context of the Administration's overall priorities in science and technology.
2. Describe the mechanisms that the Administration uses to determine priorities across scientific disciplines.
3. Describe the mechanisms the Administration uses to coordinate its scientific research and technical development activities with other federal agencies.

APPENDIX I: Budget Charts for Selected Interagency Programs

(Source for all interagency program charts: President's FY05 Budget Request)

Table 6. National Nanotechnology Initiative

(dollars in millions)

	FY03 Actual	FY04 Estimate	**FY05 Request**	Change FY04-05	
				Amount	Percent
NSF	221	254	**305**	51	20.08%
Defense	322	315	**276**	-39	-12.38%
Energy	134	203	**211**	8	3.94%
NASA	36	37	**35**	-2	-5.41%
Commerce	64	63	**53**	-10	-15.87%
NIH	78	80	**89**	9	11.25%
Other	7	9	**13**	4	44.44%
Total	862	961	982	21	2.19%

(This nanotechnology table includes corrections to Defense levels as provided by OMB.)

Table 7. Networking and Information Technology (NITRD)

(dollars in millions)

	FY03 Actual	FY04 Enacted	**FY05 Request**	Change FY04-05	
				Amount	Percent
Commerce	26	26	**33**	7	26.92%
Defense	296	252	**226**	-26	-10.32%
Energy	308	344	**354**	10	2.91%
EPA	2	4	**4**	0	0.00%
HHS	376	368	**371**	3	0.82%
NASA	213	275	**259**	-16	-5.82%
NSF	743	754	**761**	7	0.93%
Total	**1,964**	**2,023**	**2,008**	**-15**	**-0.74%**

Table 8. Climate Change Science Program

(dollars in millions)

	FY03 Actual	FY04 Enacted	**FY05 Request**	Change FY04-05	
				Amount	Percent
NSF	202	213	**210**	-3	-1.41%
Energy	120	133	**134**	1	0.75%
Commerce	117	130	**142**	12	9.23%
Ag	68	67	**74**	7	10.45%
Interior	26	28	**29**	1	3.57%
EPA	19	22	**21**	-1	-4.55%
NIH	59	61	**61**	0	0.00%
NASA	1146	1334	**1271**	-63	-4.72%
All Other	12	13	**16**	3	23.08%
Total	**1769**	**2001**	1958	**-43**	**-2.15%**

APPENDIX II:

Table 9. Federal R&D Spending (adapted from FY05 Budget Request)[1]

By Agency	2003 Actual	2004 Estimate	2005 Proposed	$ Change 04-05	% Change 04-05
Defense	58838	65484	69856	4372	7
Health and Human Services	27411	28275	29381	1106	4
NASA	10681	10893	11308	415	4
Energy	8312	8835	8893	58	1
National Science Foundation	3972	4115	4252	137	3
Agriculture	2334	2308	2105	-203	-9
Homeland Security	737	1053	1216	163	15
Commerce	1200	1126	1075	-51	-5
Veterans Affairs	819	824	772	-52	-6
Transportation	701	701	749	48	7
Interior	643	675	648	-27	-4
Environmental Protection Agency	568	575	577	2	0
Other	1223	1092	1034	-58	-5
Total	**117439**	**125956**	**131866**	**5910**	**4.7**
Basic Research					
Defense	1369	1404	1341	-63	-4
Health and Human Services	14120	14732	15198	466	3
NASA	2213	2584	2324	-260	-10
Energy	2556	2750	2664	-86	-3
National Science Foundation	3422	3551	3642	91	3
Agriculture	867	914	783	-131	-14
Homeland Security	47	47	153	106	226
Commerce	54	57	83	26	46
Veterans Affairs	327	332	308	-24	-7
Transportation	23	20	40	20	100
Interior	41	40	38	-2	-5
Environmental Protection Agency	97	79	91	12	15
Other	170	165	182	17	10
Subtotal	**25306**	**26675**	**26847**	**172**	**0.6**
Applied Research					
Defense	4252	4425	3828	-597	-13
Health and Human Services	11982	13174	13522	348	3
NASA	3192	3052	3122	70	2
Energy	2658	3020	3395	375	12
National Science Foundation	218	211	220	9	4
Agriculture	974	1049	888	-161	-15
Homeland Security	92	124	278	154	124
Commerce	910	891	838	-53	-6
Veterans Affairs	451	450	425	-25	-6
Transportation	405	398	455	57	14
Interior	547	584	560	-24	-4
Environmental Protection Agency	366	361	346	-15	-4
Other	579	609	617	8	1
Subtotal	**26624**	**28348**	**28494**	**146**	**0.5**
Development					
Defense	53172	59603	64622	5019	8.4
Health and Human Services	160	140	386	246	175.7
NASA	2963	2994	3247	253	8.5
Energy	1946	1956	1840	-116	-5.9
National Science Foundation	N/A	N/A	N/A	N/A	N/A
Agriculture	145	152	142	-10	-6.6
Homeland Security	549	794	750	-44	-5.5
Commerce	135	128	53	-75	-58.6
Veterans Affairs	41	42	39	-3	-7.1
Transportation	254	270	235	-35	-13.0
Interior	53	48	47	-1	-2.1
Environmental Protection Agency	105	135	140	5	3.7
Subtotal	**59983**	**66573**	**71729**	**5156**	**7.7**

[1] Columns do not add up due to omission of additional R&D activities at other agencies

Errata to Charter for FY 2005 Research and Development Budget Hearing:

Nanotechnology Funding

Office of Management and Budget has provided us with revised data for nanotechnology spending at the Department of Defense. The correct table for all agencies is shown below.

The new numbers for DOD spending levels in FY03 and FY04 affect the totals for the program and hence the calculated increase. With the corrected numbers, the increase for the program from FY04 to FY05 would be only $21 million, or 2 percent (rather than the 14 percent originally reported).

The corrections do not affect the data for any of the agencies appearing at the hearing or any of the five agencies[1] authorized in the *21st Century Nanotechnology Research and Development Act* (P.L. 108-153). As noted in the charter, funding at these agencies is up 8 percent to $609 million, but remains significantly below the $809 million authorized for FY05 in the Act.

Table 6. National Nanotechnology Initiative

(dollars in millions)

	FY03 Actual	FY04 Estimate	**FY05 Request**	Change FY04-05	
				Amount	Percent
NSF	221	254	**305**	51	20.08%
Defense	322	315	**276**	-39	-12.38%
Energy	134	203	**211**	8	3.94%
NASA	36	37	**35**	-2	-5.41%
Commerce	64	63	**53**	-10	-15.87%
NIH	78	80	**89**	9	11.25%
Other	7	9	**13**	4	44.44%
Total	862	961	982	21	2.19%

(Source: President's FY05 Budget Request and corrections provided by OMB)

[1] The National Science Foundation, the Department of Energy, the National Institute of Standards and Technology, the National Aeronautics and Space Administration, and the Environmental Protection Agency.

Chairman BOEHLERT. The hearing will come to order. I want to welcome everyone here this morning to our first meeting of 2004. And in this capacity, I want to welcome Mr. Gordon of Tennessee as the Ranking Member of the Committee. Mr. Gordon, welcome to your new position.

Despite the House schedule, we will still have our second hearing of the year tomorrow. As you know, we are not in session tomorrow, but we will have the hearing with Administrator O'Keefe and Dr. Marburger.

Both hearings concern what will be the issue of the year in Congress: the federal budget. I just came from the House Republican conference meeting on the budget, and I can assure you that this will be an interesting and difficult year. I think my views on the proposed R&D budget for fiscal year 2005 are already pretty well known. On the one hand, I understand that the Administration's goal was to protect science in a very austere budget environment, and I appreciate that, and I want to work with them on that. But on the other hand, we are not doing well enough.

Now I say this is not a good budget for science, but we still don't know whether it is the best budget we can get. That is going to depend much more on the overall macro decisions that Congress makes on the budget than on anything else. It is far too early to tell how things will work out. All I know is that I will be doing everything I can to see that science prospers. It is one of the best investments we can make in our economy for the future.

In particular, I would like to see a larger increase for the National Science Foundation and an increase for the Department of Energy's Office of Science. The House is on record as supporting far greater increases for those agencies, and I know that the Administration will do more for them in a less constrained environment. I also want to see the Math and Science Partnership Program remain at the National Science Foundation, where it unquestionably belongs, and where it is likely to do the most good.

And I will be putting a great deal of energy into backing the substantial increases the President has proposed for the Laboratories at the National Institute of Standards and Technology. We have to reverse the bad decisions on NIST that this Congress ratified on the omnibus spending bill and move forward. I would like to see the Advanced Technology Program and the Manufacturing Extension Program, both programs that I helped to create, be part of that moving forward.

And of course, we will continue to work with the Science and Technology Directorate of Homeland Security, which this committee created, to make sure that they continue the steady progress that they have made since coming into being under the fine leadership of Chuck McQueary.

But not everything will be determined by what I like. For example, I would like Rita Colwell to stay on longer as NSF Director, but we know that today will be her final hearing before us in her current position. I thank her for her years of service, and I know we will continue to seek her counsel as she returns to the University of Maryland and also takes on new challenges.

And just let me read a small portion of the Committee's Charter for this hearing, because I think it speaks so well to the steward-

ship of Dr. Colwell. "NSF continues to receive high marks from the Office of Management and Budget for the quality of its management and for the excellence of its program. As part of the fiscal year 2004 budget request, NSF was awarded two green lights on the Executive Branch Management Scorecard. Also, in the past year, four NSF programs were examined using the Program Assessment Rating Tool, PART as we call it. All received ratings of Effective, which is the highest rating, and the three continuing programs received substantial budget increases."

I would like to pause at this moment and ask all of you to join me and thank Dr. Colwell for her outstanding public service.

To show you the great lengths she will go to in her service, just about a year ago at this time, we were at the South Pole together to observe the construction of a new research facility at the bottom of the Earth. And it was a meaningful experience for me, and I hope for you, Dr. Colwell.

I also want to welcome Arden Bement back to the National Science Foundation where he used to serve on the National Science Board. We want Arden back at NIST as soon as possible, but we know that NSF will be in good hands under his leadership. One article in the Trade Press yesterday pointed out that Arden is low-key. In this case, that is a synonym for "quietly effective." He needs no bombast to demonstrate his leadership.

So today, we mark some significant changes in the agencies we oversee. I hope that one of those changes will turn out to be that this hearing marks the beginning of taking positive steps toward more adequate funding for science. Thank you.

Mr. Gordon.

[The prepared statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD BOEHLERT

I want to welcome everyone here this morning for our first hearing of 2004. Despite the House schedule, we will still have our second hearing of the year tomorrow with Administrator O'Keefe and Dr. Marburger. Both hearings concern what will be the issue of the year in Congress, the federal budget. I just came from the House Republican Conference meeting on the budget, and I can assure you that this will be an interesting and difficult budget year.

I think my views on the proposed R&D budget for fiscal 2005 are already pretty well known. On the one hand, I understand that the Administration's goal was to protect science in a very austere budget environment, and I appreciate that. On the other hand, it's impossible to seriously view this as a good budget for science. Now, I say that this is not a good budget for science, but we still don't know whether it's the best budget we can get. That's going to depend much more on the overall "macro" decisions the Congress makes on the budget than on anything else. It's far too early to tell how things will work out. All I know is that I will be doing everything I can to see that science prospers.

In particular, I'd like to see a larger increase for the National Science Foundation (NSF) and an increase for the Department of Energy's Office of Science. The House is on record as supporting far greater increases for those agencies, and I know that the Administration would do more for them in a less constrained environment.

I also want to see the Math and Science Partnership program remain at NSF, where it unquestionably belongs and where it is likely to do the most good.

And I will put a great deal of energy into backing the substantial increase the President has proposed for the laboratories at the National Institute of Standards and Technology (NIST). We have to reverse the bad decisions on NIST that this Congress ratified in the Omnibus Spending bill and move forward. I'd like to see the Advanced Technology Program and the Manufacturing Extension Program—both programs I helped create—be part of that moving forward.

And, of course, we will continue to work with the Science and Technology Directorate of Homeland Security, which this committee created, to make sure they con-

tinue the steady progress they've made since coming into being under the fine leadership of Chuck McQueary.

But not everything will be determined by what I'd like. For example, I'd like Rita Colwell to stay on longer as NSF director, but we know that today will be her final hearing before us in her current position. I thank her for her years of service, and I know we will continue to seek her counsel as she returns to the University of Maryland and also takes on new challenges. And I want to welcome Arden Bement back to the National Science Foundation, where he used to serve on the National Science Board. We want Arden back at NIST as soon as possible, but we know that NSF will be in good hands under his leadership. One article in the trade press yesterday pointed out that Arden is "low key." In this case, that's a synonym for "quietly effective." He needs know bombast to demonstrate his leadership.

So today we mark some significant changes in the agencies we oversee. I hope that one of those changes will turn out to be that this hearing marks the beginning of taking positive steps toward more adequately funding our agencies.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

I want to join Chairman Boehlert in welcoming our panel to this morning's hearing.

I am also going to be as blunt as the Chairman has been in also expressing my disappointment in the proposed science budget. I am also distressed about the lack of foresight that the Administration has shown in putting together this R&D budget. It is simply inadequate in light of the challenges that we are facing.

The evidence is growing every day that our nation is moving into a very difficult period of economic challenges. I don't think that anyone on this dais, on the witness panel, or even this room fully understands the dynamics of the economic forces that are operating in the world today.

We do know, however, that the international competition is intensifying. And we know that job security is increasingly shaky as more jobs, including many high-tech jobs, are being outsourced to other countries. Many of our economic competitors are training enormous numbers of scientists and engineers, which only complicates their existing advantages in wage scales—or complements their existing advantages in their wage scales.

We need to respond aggressively to these challenges by staying in the forefront of technology and by providing our young people and our older workers with the best education and training that we can. And I am afraid that the budget before us today does not secure that future.

Dr. Marburger will tell us today that his budget proposes to spend more on R&D than any budget in history. And that is technically true, but the biggest part of his R&D increase is for weapons development, which does very little for the broader economy. A better measure of R&D funding is the so-called "Federal S&T Budget," which includes civilian R&D and defense R&D, but not weapons development. And on page 61 of the Administration's own budget document under the Federal Science and Technology budget, it shows a decrease of 0.4 percent in proposed R&D funding. In other words, if this budget were enacted, the fiscal year 2005 Federal S&T budget would actually decline from 2004 levels. That is simply the wrong direction. The Federal R&D spending, as a percentage of GDP, would be at historic lows.

I would simply suggest that we can and must do better as a Nation than adopting a declining budget for Federal S&T.

Let me mention one specific area that I think this budget falls woefully short: dealing with the loss of manufacturing jobs in this country. After the President unveiled his manufacturing initiative last month, I expected this budget would contain some thoughtful new initiatives in this area. But unfortunately, I was wrong.

The Manufacturing Extension Program, probably the most effective federal program at providing immediate aid to U.S. manufacturers, is slashed severely. The ATP is eliminated and the technology transfer programs at NASA and DOE are cut. These are not wise proposals at a time when the U.S. manufacturers are in a crisis.

Mr. Chairman, we all understand that fiscal restraint is a necessity. However, it is more important now than ever that the United States remain the world's leader in innovation. This country must invest in the future and do everything possible to ensure that America does not lose its place as the leader in international innovation and R&D.

And in closing, Mr. Chairman, if I could simply relate a meeting that happened in my office the other day. Some folks came in, and like many, they were very concerned about jobs being outsourced to the rest of the world. And they said, "Well, how do we slow down technology so that this outsourcing won't happen any longer?" And I said, you know, "We don't do that by slowing it down; we have to speed it up. We have to increase our investment in R&D and research so that we are a generation or two generations ahead of them. That is how we stop jobs from going overseas is by speeding up, not slowing down."

And with that, Mr. Chairman, I yield back the balance of my time.

[The prepared statement of Mr. Gordon follows:]

PREPARED STATEMENT OF REPRESENTATIVE BART GORDON

I want to join Chairman Boehlert in welcoming our panel to this morning's hearing.

I am going to be as blunt as the Chairman has been today in expressing my disappointment in the proposed science budget. I am also distressed about the lack of foresight that the Administration has shown in putting together this R&D budget. It is simply inadequate in light of the challenges that we are facing.

The evidence is growing every day that our nation is moving into a very difficult period of economic challenges. I don't think that anyone on this dais, on the witness panel, or even in this room fully understands the dynamics of the economic forces that are operating in today's world.

We do know, however, that international competition is intensifying. And we know that job security is increasingly shaky as more jobs, including many high-tech jobs, are being out-sourced to other countries. Many of our economic competitors are training enormous numbers of scientists and engineers, which only complements their existing advantages in wage scales.

We need to respond aggressively to these challenges by staying on the forefront of technology and by providing our young people and our workers with the best education and training that we can. I am afraid that the budget before us today does not secure that future.

Dr. Marburger will tell us today that this budget proposes to spend more on R&D than any budget in history. That is technically true, but the biggest part of this R&D increase is for weapons development, which does very little for the broader economy. A better measure of R&D funding is the so-called "Federal S&T Budget," which includes civilian R&D and defense R&D, but not weapons development. On page 61 of the "Analytical Perspectives" document from this year's budget, the Administration's own budget document actually shows a *decrease* of 0.4 percent in proposed R&D funding. In other words, if this budget were enacted, the FY 2005 "Fed-

eral S&T Budget" would actually decline from the 2004 levels. And Federal R&D spending, as a percentage of GDP, would be at historically low levels.

I would simply suggest that we can and must do better as a nation than adopting a declining budget for Federal S&T.

Let me mention one specific area where I think this budget falls woefully short—dealing with the loss of manufacturing jobs in this country. After the President's unveiled his manufacturing initiative last month, I expected that this budget would contain some thoughtful new initiatives in this area. Instead, we get more of the same old rhetoric.

The Manufacturing Extension Program—probably the most effective federal program in providing immediate help to U.S. manufacturers—is slashed severely. The Advanced Technology Program is eliminated and technology transfer programs at NASA and DOE are cut. These are not wise proposals when at a time when U.S. manufacturing is in crisis.

Mr. Chairman, we all understand that fiscal restraint is a necessity. However, it is more important now than ever that the United States remain the world's leader in innovation. This country must invest in its future and do everything possible to ensure that America does not lose its place as the leader in global innovation and R&D.

Chairman BOEHLERT. Thank you very much.

So it will be clear to everyone, based upon my remarks, I am not advocating that we add to the deficit, I am—and that is very Republican of me, I suppose, but I am suggesting that some of the priorities need to be addressed so that we get the funding that we need for the important programs we are going to be discussing today. And I would point out to one and all that the ten years of unprecedented growth in our economy in the '90's into the new century, quarter after quarter, year after year of growth was largely driven by the investment this Nation made in technology. It is an information and technological age, and we have to continue that. That is how we best prepare ourselves to address the challenges from all points of the globe.

With that, without objection, all Members have leave to submit their record—statements into the record at this juncture.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF REPRESENTATIVE NICK SMITH

I want to thank all of the witnesses for appearing before the Committee today to help us review the President's FY05 budget request for R&D. I also want to welcome Mr. Hall to our side of the room and extend my best to his replacement Mr. Gordon. I look forward to working with both of you in your new capacities.

I'd also like to welcome Dr. Rita Colwell, take this opportunity to thank her for her exceptional service as Director of the National Science Foundation, and wish her success in her new rolls in the private sector and as a distinguished professor at the University of Maryland. Rita has successfully guided NSF through a period of significant change and expansion. Since I became Chairman of the Research Subcommittee, she and I have worked closely and cordially to ensure that NSF remains the gem federal research agencies.

The overall R&D budget request before us today is, in short, a continuation of what we have seen in the last two or three years. The top-line increase is about five percent, with the largest portion of those increases going toward defense and homeland security. The non-defense, non-homeland security R&D budget increase is just over two percent—disappointing, yet not unexpected, and still higher than overall non-defense discretionary spending.

I want to preface my remarks this morning with some thoughts on the larger budget picture, as our ability to address our priorities in the R&D budget will be substantially dictated by the budget situation at a macro level.

We are facing a massive and ever-increasing debt, and a record deficit of $535 billion for the next fiscal year. To be fair, some of this plunge into deficits has been the result of events largely beyond our control—primarily the general downturn in the economy that began in March of 2000, coupled with the substantial impact of the 9/11 attacks on defense spending and general revenues. Still, spending on non-

security discretionary items has been out of control, rising at more than three times the rate of inflation over each of the last three years.

As we begin the legislative year and sort through the budget, there will be a great deal of discussion on how to address these problems. There is, I think for the first time in years, a clear sense that the spending binge of the last few years has resulted in a spending hangover. To that end, many members, including myself, will be pushing for a freeze on non-defense, non-homeland security funding, and even in these areas, any increases need to be balanced with reductions in other areas.

I will continue to support increases for leading R&D agencies such as NSF. Significant new investment in NSF—a true model of government efficiency—is quite important to our long-term economic and national security, and I will work to see that NSF's budget more closely reflects the guidance set forth in my reauthorization legislation of 2002.

Funding increases that would allow NSF to meet its goals could be accomplished by reducing increases in other areas such as NASA, NIH, and elsewhere. First and foremost, I believe, should be stopping the reckless practice of earmarking our R&D funds. As noted in the President's budget, academic earmarking continues to break records, skyrocketing from just $296 million in 1996 to over $2 billion today. This increase—$1.7 billion—is more than the current shortfall between the NSF budget request and the authorized level for FY 2005. We need to make a better effort to spend those funds on only the best investigator-driven competitive research.

Another area that demands critical evaluation is our space program. We must remember that if NASA funding increases by $12.6 billion over the next five years for substantial new long-term efforts in space exploration as the President has proposed, it will come at the expense of other priorities.

I'd also like to express my serious concerns about the President's proposal to eliminate the promising Math and Science Partnership (MSP) Program at NSF. I have the pen that the President used to sign this new initiative into law just 14 months ago. The program intends to create real and lasting reforms in math and science education. I think this is critical to producing a technologically literate and innovate workforce of tomorrow, and it should be continued in the National Science Foundation. I feel so strongly about the importance of math and science education that I will be introducing legislation to establish a national recognition award program for companies and associations that do exceptional work to promote math and science in our K–12 schools. The administration's budget does not even attempt to provide a rationale for the elimination of MSP. If there are aspects of the program that are troubling, they should be addressed, and I am willing to work to see that is done. However, in the meantime, let us not jeopardize the success of this program.

I want to thank the Chairman for holding this hearing today, and I look forward to a productive discussion.

[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF REPRESENTATIVE VERNON J. EHLERS

The President's FY 2005 budget request reflects several pressing national priorities, including the continuing war on terrorism, facilitating economic stimulus, and maintaining fiscal responsibility. The Congress will have many difficult choices to make in order to balance these priorities, control the deficit and implement our considerable domestic spending commitments.

In making these choices, we must not overlook the fact that scientific research and development underpins all of these priorities. Scientific research and development forms the foundation of increased innovation, economic vitality and national security. Scientific research is an investment that promises, and has historically delivered, significant returns on that investment.

For the past several years, research and development funding for defense, weapons development, biomedical sciences, and national security has increased while other areas of federal research and development, especially basic research in the physical sciences, has remained flat or declined. The President's FY 2005 request of $132 billion for research and development continues this trend.

Basic science research and education are essential to advances in medicine, military applications and continued economic prosperity, including the development of cancer therapies, GPS- or laser-guided missiles, and the Internet. As a nation, we cannot afford to starve basic science research and education.

I want to particularly emphasize three science research and development programs that deserve Congress' utmost attention: the National Science Foundation,

the National Institute of Standards and Technology, and the Department of Energy's Office of Science.

The FY 2005 request of $422 million for NIST's labs is an $85 million (22 percent) increase over the levels enacted in FY 2004. But, it is important to note that NIST's FY 2004 enacted budget was $22 million below the FY 2003 appropriation, primarily due to significant cuts in NIST's core laboratory account. I believe that the FY 2005 request for NIST's labs should be considered the absolute minimum required for NIST to carry out its critical research activities. Much of the technology we use every day can be tied to research done by scientists at NIST. For example, work at NIST's labs supports our nation's efforts to improve cyber security, building safety, and voting technology—three areas where this committee recently recognized the high-quality work that NIST performs by expanding NIST's authorizations for these topics. For our nation to remain competitive in a high-tech world, we must support these research programs that will provide the foundation for future scientific advances.

I am very concerned about the FY 2005 request for the Manufacturing Extension Partnership (MEP) program. The FY 2004 appropriation cut the funding for MEP by more than 65 percent. My constituents have expressed dismay that the FY 2005 request did not seek to restore this cut, and I fear that the FY 2005 request, if funded at this level, will continue to cripple this unique program's ability to promote innovation among small- and medium-size manufacturers as they adapt to the globalized economy.

The National Science Foundation (NSF) is the only federal agency dedicated solely to supporting basic scientific research and math and science education. NSF represents four percent of the total federal R&D budget, yet it accounts for 45 percent of non-life science basic research at U.S. academic universities. In 2002, Congress passed the *National Science Foundation Authorization Act of 2002* (P.L. 107–368) and made a commitment to double NSF funding over five years. The FY 2005 budget request for NSF is $5.75 billion. Although this is an increase of three percent, it falls $1.6 billion below the authorized funding level necessary to complete our doubling commitment.

NSF is the primary federal supporter of science and math education; it underwrites the development of the next generation of scientists and engineers. In the FY 2005 budget request, many of the education programs at the K–12 and undergraduate level will be cut. The Math and Science Partnership (MSP) program will be eliminated from NSF and merged with a Department of Education program that focuses only on mathematics for secondary school students. These budget choices seriously undercut our efforts to improve math and science education and to ensure that America has an educated workforce capable of competing in the global economy.

The Department of Energy, Office of Science funds 40 percent of our nation's physical science research. Research in these areas has led to new economic and medical advancements including new energy sources, cell phones, and laser surgery. In constant dollars, physical science research funding has remained at 1993 levels while biological research has more than doubled in that same time. We must bring funding for the physical sciences into balance with that of the life sciences. The FY 2005 budget request of $3.43 billion for the Office of Science—a decrease of two percent from the FY 2004 enacted level—does not achieve that goal.

FY 2005 will be a tough budget year. Significant sacrifices and compromises in spending must be made. We must not, however, sacrifice the research and education which future generations will need to ensure their economic prosperity and domestic security.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good morning. I want to thank the witnesses for appearing before our committee to discuss the President's FY05 Budget for Research and Development. Today's hearing serves as an opportunity for oversight of certain departmental programs. As you are aware, a number of trends spotted in last year's budget submission are seen again in the FY05 budget, including reversal of the trend toward parity in defense and non-defense R&D, the marginal increase in the National Science Foundation budget, and targeting of cooperative government-industry programs for cuts.

There are a number of new initiatives that build upon the current direction in scientific research, as well as a number of previous initiatives that have been introduced in a new format.

The Department of Energy's Fossil Energy Research and Development program impacts my congressional district because the coal industry is of great importance to the economy and livelihood of my constituents in Southern Illinois. As you may know, this area is rich in high-sulfur coal. The shifting of production to low-sulfur coal has cost many of my constituents high-paying jobs. I welcomed the inclusion of $237 million for the FutureGen clean coal power plant project. Further developing the technology to burn coal as cleanly as possible is a great national investment and it will benefit the economy of Southern Illinois. I have led the effort to locate FutureGen in Illinois, including leading a bipartisan effort in the House to secure funding for the project. I also hosted a roundtable discussion regarding FutureGen and what it means for Illinois with Governor Blagojevich, U.S. Senators Durbin and Fitzgerald, and U.S. Congressman John Shimkus. Dr. C. Lowell Miller, Director of the Office of Coal Fuels and Industrial Systems at the Department of Energy, made a presentation on the specifics of the project. Implementing the coal research program, which includes the clean coal technology program and FutureGen, is significant to my district, and I look forward to learning more about planned spending in this area.

I am displeased to see the Advanced Technology Program was eliminated and the Manufacturing Extension Program (MEP) was significantly cut in the President's budget. The Illinois Manufacturing Extension Center (IMEC) has worked with 362 small and mid-sized manufacturers. These companies reported that they expected to achieve $165 in benefits for every dollar they invested in IMEC services. In all, these manufacturers reported more than $346 million in sales, cost savings, and productivity. The FY05 budget will leave the MEP Centers struggling to survive rather than focused on what they do best: helping businesses increase competitiveness, efficiency and productivity- exactly what our economy needs to get back on track.

Finally, I am also displeased to see that most accounts under Renewable Energy Resources remain flat, decreased, or were eliminated. Non-fossil energy sources including ethanol, solar power, and wind energy are extremely important initiatives and I believe we should dedicate more resources toward these programs.

I welcome our panel of witnesses and look forward to their testimony.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman. I also would like to thank our witnesses for agreeing to appear before us today. The purpose of this hearing is to provide an opportunity to explore issues affecting the entire Research and Development (R&D) budget.

I am very excited about this hearing today because we will be discussing something that is very close to my heart, and that is National Science Foundation (NSF) funding.

Two years ago, Congress sent the President a bill authorizing a doubling of NSF's program over five years. Despite signing that bill to glowing reviews, the President has sent us three successive budgets that fall far short of reaching that goal. This marks a fundamental breach of trust with our institutions of higher education and with our children, who depend on NSF to fund the best and brightest to pursue the most promising scientific insights. The only thing more surprising is the 18 percent cut to the education and human resources budget account from an administration that has claimed education of our youth as one of its rhetorical hallmarks.

There must be a balance between research in the biomedical sciences and research in the physical sciences and engineering. There must also be policies for achieving balance between the dissemination of research results with national security needs.

All of this is imperative so that the policies and programs meet the future human infrastructure needs of the Nation in science and engineering.

Thank you, Mr. Chairman.

Chairman BOEHLERT. And we will go right to our distinguished panel of outstanding witnesses, friends to all and resources to all: Dr. John H. Marburger III, Director, Office of Science and Technology Policy, and affectionately referred to as the Science Advisor to the President; Dr. Rita R. Colwell, Director of the National Science Foundation; Dr. Charles E. McQueary, Under Secretary for Science and Technology, Department of Homeland Security. And Dr. McQueary, we take great pride in this committee in adding to

the proposal from the Administration. We detected a void, and we filled that void by creating your operation. And I think you are serving admirably, and we look for great things from you. An old friend, long-standing, Phillip J. Bond, Under Secretary of Commerce for Technology, and Dr. Raymond L. Orbach, Director, Office of Science, Department of Energy. And it surprises none of you to know that you are in friendly territory.

With that, we will start with Dr. Marburger. You are up, sir.

STATEMENT OF DR. JOHN H. MARBURGER III, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY

Dr. MARBURGER. Thank you, Mr. Chairman. It is a great pleasure to be here to discuss the President's 2005 budget for R&D this year with the Committee, but before I do, I would like to add my praises to yours for Rita Colwell's many years of service to American science, years that are not yet over. I have been aware of Dr. Colwell's plans for some time, and they are very exciting. I leave it to her to elaborate on them, but I am sorry that she is leaving. She is leaving an agency that has expanded greatly in size and in the level of excellence under her leadership, and I look forward to seeing her products in the future and helping to make careers like her's possible for other scientists throughout the Nation. So thanks, Rita.

The President's fiscal year 2005 budget request commits 13.5 percent of the total discretionary outlays to research and development, which is the highest level in 37 years. Not since 1968, during the Apollo program, have we seen an investment of this magnitude in federally funded R&D. Of that amount, the budget commits fully 5.7 percent of total discretionary outlays to non-defense R&D, which is the third highest level in 25 years.

Under this proposed budget, the total R&D investment over the four years of this Administration would be increased by 44 percent to a record $132 billion in 2005, compared to $91 billion in 2001. This substantial investment is reaping benefits in American scientific and technological leadership. We are a stronger Nation—more formidable in defense, more productive in labor—and we are more effective and healthier individuals because of our willingness to invest in basic and applied research and technical development. President Bush understands that science is the basis for innovation and innovation is the basis for a secure Nation and a strong economy.

President Bush is also determined to control the deficit and reduce it as the economy continues to grow, while ensuring that our national security needs are met. Funding the Nation's expanding security needs while limiting non-security budget growth to less than 0.5 percent will lead to smaller increases for other categories, including some R&D programs. This situation increases the need for careful planning, prioritization, and implementation of our research and development programs. The President's R&D budget for this year targets opportunities and needs in a balanced and disciplined way, and my colleagues and I welcome your support, and need it, to realize the benefits for America implicit in this proposal.

I don't have too much time this morning. I have many colleagues that can fill in gaps, so I will only say a few details about the agencies and provide an overview.

Of this $132 billion R&D budget, it is true that programs in the Department of Defense account for about half, and programs administered by the National Institutes of Health account for nearly half of the remainder. These agencies are not represented on today's panel, but with ¾ of the R&D budget, they obviously have a large impact on the Nation's science and technology activities. I mention them here, because they do participate in the interagency coordination for which my office is responsible, and their contributions are essential for a balanced and effective R&D effort.

Here are the increases that are proposed in this budget—the changes in this R&D budget for the largest agencies. The Department of Defense is up seven percent from the 2004 enacted level. Health and Human Services is up four percent, of which $28.6 billion goes to NIH, which is an increase of 2.6 percent. NASA's budget will increase 5.6 percent to $16.2 billion. NSF's budget will increase three percent to $5.75 billion. The portion of the Department of Energy Office of Science budget not impacted by congressional earmarks is increased by 3.3 percent. All of these increases substantially exceed the average domestic discretionary budget increase of 0.5 percent for non-security related activities.

Mr. Chairman, this reference to earmarks in the Department of Energy's Science budget points to an issue that is highlighted once again in the narrative of the President's budget request. In 2003, earmarks accounted for eight percent of all federal research funding to colleges and universities. The existence of congressionally directed expenditures in appropriations language poses difficult problems for agencies that are attempting to improve their planning and management of research programs. It tends to disrupt interagency coordination, and it reduces the ability of agencies to direct their funds to the most productive projects.

Unplanned transfers in response to congressional direction obscure the budget picture this year not only for DOE, but for the Department of Defense, NASA, the U.S. Geological Survey, and the U.S. Department of Agriculture. In each case, the enacted 2004 budgets entail transfers out of agency priorities into other programs. Congress certainly has the right to establish its priorities, but the earmark subset of those priorities creates holes in productive programs in these agencies that the President's budget seeks to fill. The President's commitment to this Administration's science and technology priorities is measured by the increments to those budgets, omitting the congressionally directed programs. And by this measure, in each of the cases I have mentioned, apparent reductions are shown actually to be increases in the agencies' own priority areas. For example, just one example, the President's budget adds three percent to the agency's priority aeronautics research programs in NASA, but other programs received a number of earmarks in fiscal year 2004 that lead to an apparent decrease of 11 percent in the fiscal year 2005 proposal.

I wanted to bring this to your attention, Mr. Chairman, because this Administration is committed to establishing priorities and

standards and following through on them. I appreciate this committee's historical support of good planning and peer-reviewed, merit-based award of science funding, and I look forward to working with you to make sure that that continues in the future.

There are priorities in this budget, and they are familiar to this committee. The National Nanotechnology Initiative is up two percent overall, and up 9.3 percent in non-defense agencies. The National Information Technology R&D program, which is a mature, multi-billion dollar program, is down by about one percent overall. It is up slightly in non-defense agencies. Both of these priority programs have increased substantially in this Administration. The President's Hydrogen Fuel Initiative, a small initiative, is increased by 43 percent. Physical sciences and engineering funding is strengthened through increases by 20 percent in nanotechnology and 12 percent in cyberinfrastructure in the National Science Foundation, and other targeted increases in budgets in the Department of Energy, NIST, and other agencies.

The large increases in the Department of Defense R&D add significantly to the engineering sector. Homeland Security R&D, among all agencies, is increased to about $3.6 billion, with emphasis on bioterrorism, food, and agriculture security, and countering chemical, biological, radiological, nuclear, and other catastrophic threats.

Much more detail is contained in my written testimony and in the other materials available from the agencies. Here, I only wanted to convey the outlines of this strongly priorities-driven budget.

Mr. Chairman and Committee Members, I believe the President's 2005 budget proposal does maintain science and technology R&D at world leadership levels. Thank you again for your strong historical support of the President's R&D goals, and I will be pleased to answer questions.

[The prepared statement of Dr. Marburger follows:]

PREPARED STATEMENT OF JOHN H. MARBURGER III

Mr. Chairman and Members of the Committee, I am pleased to meet with you today to discuss the President's federal research and development budget for fiscal year 2005.

I have appreciated the close and productive relationship with this committee and look forward to working with you again this year as we make important choices to optimize federal R&D investment. Your continued support of our country's research and engineering enterprise is yet another reason why the U.S. Government continues to lead the world in research and development.

The President said in his State of the Union address that "Our greatest responsibility is the active defense of the American people," which includes not only winning the war on terrorism, but also securing the homeland. The President's budget focuses on these important priorities and builds on the economic recovery now underway. The Administration is also determined, however, to control the deficit and reduce it as the economy continues to grow, while ensuring that our national security needs are met. Funding the Nation's expanding national and homeland security needs while limiting other budget growth to less than 0.5 percent will lead to smaller increases for other categories, including some R&D programs.

In my testimony today, I would like to place the President's R&D request in the context of strong support for science and technology in this Administration. With the President's FY 2005 budget, total R&D investment during the first term will be increased by 44 percent, to a record $132 billion in 2005, compared to $91 billion in FY 2001. That equates to increases of nearly ten percent each year. This Administration understands that science and technology are major drivers of economic growth and important for securing the homeland and winning the war on terrorism. The President's budget, as in years past, continues to emphasize improved manage-

ment and performance to maintain excellence and sustain our national leadership in science and technology.

In my prepared statement I will review the broad goals of the President's budget and provide an overview of the request for federal research priorities that cut across multiple agencies and research disciplines.

THE PRESIDENT'S FY 2005 R&D BUDGET

The President's FY 2005 budget request commits 13.5 percent of total discretionary outlays to R&D, the highest level in 37 years. Not since 1968 during the Apollo program have we seen an investment in research and development of this magnitude. Of this amount, the budget commits 5.7 percent of total discretionary outlays to non-defense R&D, the third highest level in 25 years.

The programs in the federal R&D budget continue to build upon exciting areas of scientific discovery from hydrogen energy and nanotechnology to the basic processes of living organisms, the fundamental properties of matter, and a new vision of sustained space exploration. Not all programs can or should receive equal priority, and this budget reflects priority choices consistent with recommendations from numerous expert sources. In particular, this budget responds to recommendations by the President's Council of Advisors on Science and Technology (PCAST) and others about needs in physical science and engineering.

The budget also reflects an extensive process of consultation among the federal agencies, OMB, and OSTP, to understand thoroughly the agency programs and priorities, interagency collaborations, and directions for the future. The National Science and Technology Council (NSTC) continues to provide a valuable mechanism to facilitate this interagency coordination. This process resulted in guidance to agencies issued by OSTP and OMB last June, concerning their program planning, evaluation, and budget preparation, and culminating in the budget you see before you today.

An important component of this budget is an increase in education and workforce development, which are essential components of all federal R&D activities and continue to be high priorities for the Administration. As President Bush has stated, "America's growing economy is also a changing economy. As technology transforms the way almost every job is done, America becomes more productive, and workers need new skills."

As in previous years this R&D budget highlights the importance of collaborations among multiple federal agencies working together on broad themes. I will describe high-priority R&D initiatives for FY 2005 in five categories: a cluster of programs fostering innovation, which includes the National Nanotechnology Initiative, Networking and Information Technology, and manufacturing; the hydrogen fuel initiative; space exploration; physical sciences and engineering; and homeland security.

AGENCY BUDGET HIGHLIGHTS

Each agency has an opportunity to describe its own programs. In this testimony I will concentrate on priority programs that cut across agency boundaries. Here I will only give a quick overview of science agency budgets proposed for FY 2005.

Department of Defense (DOD):

The Defense Department's FY 2005 R&D budget is almost $70 billion. This funding helps ensure that our military forces have the tools to protect themselves and our nation and helps the Nation avoid technological surprise by our adversaries in the future. It provides support for the entire spectrum of R&D, including the longer-term Science and Technology programs, totaling $10.5 billion for basic and applied research and concept and prototype development, through development of systems and test and evaluation of systems. Development programs include: ballistic missile defense; the Joint Strike Fighter; the next generation destroyer; the Army Future Combat System; and chemical and biological defense systems and technology; to name just a few. A total of $5.2 billion is provided for basic and applied research, which, for the Department of Defense, promotes the thinking and experimentation that will form the basis for future generations of systems and capabilities that help deter adversaries from attack or, when deterrence fails, allows us to defeat the attacker. This level is $225 million, or five percent, more than FY 2001. And when you subtract earmarks out, the 2005 request for basic and applied research funding actually increases by about $370 million over the appropriated FY 2004 level.

National Institutes of Health (NIH):

Building on the research momentum generated by the fulfillment of the President's commitment to complete the five-year doubling of the NIH budget, the FY 2005 budget provides $28.6 billion for NIH, an increase of $729 million or 2.7 percent over 2004. Since 2001, the NIH budget has grown by $8.2 billion or 40 percent.

The budget's strong investment in new NIH grants illustrates the Administration's continued commitment to research. The budget includes 10,393 new grants, 258 more than last year and equal to the highest level ever awarded.

As NIH ushers in the next century of biomedical research, it is beginning to transform our medical research capabilities, such as improving access to state-of-the-art instrumentation and biomedical technologies; developing of specialized animal and non-animal research models; and emphasizing "smart" network connected technologies, computer-aided drug design, gene and molecular therapy development, and bioengineering approaches to decrease health care costs. In addition, the NIH budget continues to support biodefense research by providing $1.74 billion to accelerate clinical trials, target the development of new therapeutic and vaccine products for agents of bioterrorism, and establish Regional Centers of Excellence in Biodefense and Emerging Infectious Diseases.

National Science Foundation (NSF):

The 2005 budget provides $5.75 billion for NSF, a three percent increase over the 2004 enacted level. Since 2001 the NSF budget has increased by 30 percent.

The budget provides over $1 billion for NSF programs that emphasize the *mathematical and physical sciences,* including mathematics, physics, chemistry, and astronomy. These programs have increased by 31 percent since 2001.

NSF participates strongly in this Administration's *cross agency priority programs* in information- and nano-technology, climate science, and education. This budget provides $761 million for NSF's part in the *National Information Technology R&D* initiative, focusing on long-term computer science research and applications; $210 million for *climate change science;* and $305 million for NSF's lead role in the *National Nanotechnology Initiative,* a 20 percent increase from the 2004 level.

Science and math education is strongly supported in this budget, with funds for 5,500 graduate research fellowships and traineeships, an increase of 1,800 since 2001. Annual stipends in these programs have increased to a projected $30,000, compared with $18,000 in 2001.

Science infrastructure funding is provided to initiate construction for the National Ecological Observation Network (NEON), the Scientific Ocean Drilling Vessel, and a set of experiments in fundamental physics called "Rare Symmetry Violating Processes" (RSVP).

Department of Energy (DOE):

The 2005 budget provides $8.9 billion for R&D at DOE, a $1.1 billion (or 14 percent) increase since 2001.

DOE has the lion's share of the President's *Hydrogen Fuel Initiative* to accelerate the worldwide availability and affordability of hydrogen-powered fuel cell vehicles. This Initiative is proposed at $228 million—a threefold increase over 2001. For the first time it will include basic research investments in the DOE Office of Science focused on understanding and controlling the chemical and physical interactions of hydrogen with materials.

DOE will also continue its efforts to reduce the cost of *renewable energy technologies,* such as wind, solar, geothermal, and biomass at $375 million, a five percent increase over current funding. The budget provides a three percent increase for *nuclear energy R&D,* including $34 million for the Generation IV Nuclear Energy Systems Initiative to develop next-generation nuclear reactor and fuel cycle technologies that are sustainable, proliferation-resistant, and economical.

Electricity transmission and distribution reliability R&D activities are funded at $91 million, a 12 percent increase over 2004. These funds include $45 million for high temperature superconductivity, $6 million for the new Gridworks program to support research that will enable power lines to carry more power and better control the flow of electricity to prevent blackouts, and $5 million for the Gridwise program to improve the communications and control system for the electricity grid.

This budget provides $3.4 billion for the *Office of Science,* including funding to ensure its continuing leadership in physical science research and its unique research in genomics, climate change, and supercomputing. The fifth and final nanoscience research center will begin construction as part of the Office's $211 million investment in the National Nanotechnology Initiative, 57 percent more than four years ago.

Department of Commerce:

The 2005 budget provides over $1 billion for R&D at the Department of Commerce.

National Institute of Standards and Technology (NIST) "core" programs receive $482 million for research and physical improvements at NIST's measurement and standards laboratories. This supports equipment for the Advanced Measurement

Laboratory and overdue renovations of facilities. These "core" R&D programs are exceptionally high-leverage activities that foster commercialization of new technologies through the development of measurement tools and methods, and the establishment of industrial standards. In an era of global commerce, strong national standards help to protect the interests of U.S. production by reducing artificial technical barriers to trade. The *Manufacturing Engineering Laboratory,* whose role is to strengthen manufacturing innovation, is funded at $30 million, 50 percent over 2001. I would urge that Congress strongly support these key "competitiveness" R&D activities. Last month's Congressional reduction of $22 million in these programs goes in the wrong direction.

The 2005 budget again proposes to terminate the *Advanced Technology Program* (ATP). The Administration believes firmly that other NIST research and development programs are both necessary and more effective in supporting the fundamental scientific understanding and technological needs of U.S.-based businesses, American workers, and the domestic economy.

For the *National Oceanic and Atmospheric Administration* (NOAA), the 2005 budget provides $350 million for ongoing research on climate, weather, air quality, and ocean processes, 11 percent more than 2001. This funding level includes $19 million for NOAA to expand climate observing capabilities in support of the Administration's recently released Climate Change Science Program (CCSP) Strategic Plan.

National Aeronautics and Space Administration (NASA):

The President has committed the United States to a *sustainable, affordable program of human and robotic exploration of the solar system and beyond,* including a human return to the Moon that will ultimately enable future human exploration of Mars and other destinations. This vision not only sets a course to the planets, but also focuses technology development applicable to society on Earth.

To support this and other NASA missions, the budget requests $16.2 billion in FY 2005 and $87 billion over five years, an increase of $1 billion over the FY 2004 five-year plan. NASA will reallocate $11 billion within this five-year amount toward new exploration activities. Robotic trailblazers to the Moon will begin in 2008, followed by a human return to the Moon no later than 2020. The pace of exploration will be driven by available resources, technology readiness, and our ongoing experience.

The budget continues the growth in space science with a request for $4.1 billion in FY 2005, an increase of $1.5 billion, or over 50 percent, since 2001. This budget supports the next generation of space observatories that will be used to better understand the origin, structure, and evolution of the universe. The budget also initiates new exploration missions to Mars.

The 2005 budget supports a variety of key research and technology initiatives to enable the space exploration vision. These initiatives include *refocusing U.S. research on the International Space Station* to emphasize understanding and countering the impact of long-duration space flight on human physiology. In addition, the agency will pursue optical communications for increased data rates throughout the solar system, space nuclear power to enable high-power science instruments, advanced in-space propulsion technologies, and systems that enable robots and humans to work together in space.

Although exploration will become NASA's primary focus, the agency will not forsake its important work in improving the Nation's aviation system, in education, in Earth science, and in fundamental space science.

Department of Transportation (DOT):

The budget provides $659 million for science at DOT, an increase of $53 million (nine percent) over 2004, distributed as follows:

The Federal Highway Administration receives $429 million to support research, technology and education to improve the quality and safety of the Nation's highway transportation infrastructure with initiatives such as increasing the quality and longevity of roadways, identifying safety improvements and promoting congestion mitigation efforts.

The Federal Aviation Administration receives $117 million to continue critical safety and capacity research with initiatives such as the Joint Planning and Development Office's planning and development of the next generation air transportation system.

The National Highway Traffic Safety Administration receives $103 million for R&D in crash worthiness, crash avoidance, and data analysis to help reduce highway fatalities and injuries.

Department of Homeland Security (DHS):

Research and development funding within DHS continues to be a priority with $1.2 billion in FY 2005, an increase of 15 percent over FY 2004 enacted. R&D is focused on countering chemical, biological, radiological, nuclear, and other catastrophic threats.

In 2005, the Administration will launch a *biosurveillance initiative* that includes $274 million for integrated monitoring of human health, food, agriculture and the environment. This plan includes $118 million for the expansion of the BioWatch program and $11 million to enable the Department of Homeland Security to integrate widely collected biosurveillance data in real-time.

The budget includes $60 million to continue research and development of *countermeasures to protect commercial aircraft* against man portable air defense systems (MANPADS).

The President's budget also funds the *Homeland Security Scholars and Fellows Program* that provides scholarships to students pursuing scientific studies in homeland security, and the *Homeland Security Centers of Excellence* (HS–Centers) program, a coordinated university-based system to enhance the Nation's homeland security.

PRIORITY INITIATIVES

The 2005 budget highlights high priority inter-agency initiatives described briefly below. These initiatives are coordinated through the National Science and Technology Council (NSTC) for which my office has responsibility for day-to-day operations. The Council prepares research and development strategies that cross agency boundaries to form a consolidated and coordinated investment package.

Innovation—The FY 2005 budget calls for research and development investments to promote technological innovation in high-priority areas including nanotechnology, information technology and manufacturing; the creation of incentives for increased private sector R&D funding; and stronger intellectual property protections. These investments will stimulate innovation and enhance U.S. competitiveness.

- *Nanotechnology.* The President's budget includes $1 billion in funding to increase understanding, and develop applications based upon, the unique properties of matter at the nanoscale—that is, at the level of clusters of atoms and molecules. Funding for nanotechnology R&D has more than doubled since 2001.
- *Networking and Information Technology.* Since 2001, funding for networking and information technology R&D has increased by 14 percent to over $2 billion, and the R&D funded by this effort has laid the foundation for many of the technological innovations that have driven this sector forward. The President's FY 2005 budget sustains this significant investment.
- *Manufacturing Technology.* The President's budget requests increased funding for a number of programs that strengthen manufacturing innovation, including those within the National Science Foundation's Design, Manufacture and Industrial Innovation Division—up 27 percent since 2001 to $66 million—and the Manufacturing Engineering Laboratory at the National Institute of Standards and Technology (NIST)—up 50 percent since 2001 to $30 million. The FY 2005 budget sustains funding for the Manufacturing Extension Partnership at the 2004 level and proposes to implement reforms to improve the efficiency and effectiveness of the program.

Hydrogen Fuel Initiative—The Hydrogen Fuel Initiative (HFI), announced in the President's 2003 State of the Union address, seeks to help industry develop practical and cost-effective approaches using hydrogen to power automobiles. HFI focuses on technologies for the production, storage, and delivery of hydrogen, and on the enhancement of fuel cells that promise unusually efficient and clean sources of power. The 2005 budget for HFI is $228 million, 43 percent larger than the amount just enacted for FY 2004.

The 2005 budget expands fundamental research related to hydrogen fuel technology within the Department of Energy (DOE) Office of Science. Basic research is necessary for improved technologies for hydrogen production, storage, and conversion.

HFI supports research on hydrogen production from renewable energy, coal, nuclear energy, and biomass, safe and effective hydrogen storage systems, and affordable hydrogen fuel cells for consumer automobiles. The Initiative has spurred increased hydrogen technology development efforts among private-sector, state, and international stakeholders.

Physical Sciences and Engineering—Research in the physical sciences and engineering is an essential component of space exploration, nanotechnology, networking and information technologies, biomedical applications, and defense technologies. The President's 2005 budget strengthens the Nation's investment in the physical sciences and engineering by making significant investments in these, and other, priority areas.

- *National Science Foundation* (NSF). The President's budget provides $1.1 billion for the Mathematical and Physical Sciences, and proposes significant increases for the priority areas of nanotechnology (up 20 percent to $305 million) and cyberinfrastructure (up 12 percent to $399 million).
- *Department of Energy* (DOE). The budget provides $3.4 billion for DOE's Office of Science, a $52 million decrease from FY 2004 enacted. Excluding Congressionally directed projects for 2004 that are not proposed for 2005, the Office of Science budget would increase by $88 million (+2.6 percent). The budget includes increases in priority areas such as nanotechnology (up four percent to $211 million), targeted hydrogen and fuel cell research (+$21 million), national scientific user facility operations (+$46 million), and initial funding for the development of an x-ray laser light source that will open entirely new realms of discovery in materials, chemistry, and biology.
- *Department of Commerce* (DOC). The President's budget includes $53 million in nanometrology research at NIST.

Homeland Security—Research and development (R&D) funding for homeland security continues to be a priority with an estimated $3.6 billion in FY 2005, tripling the resources dedicated in FY 2002, the first budget following the terrorist attacks of September 11, 2001. Research and development is focused on countering chemical, biological, radiological, nuclear, and other catastrophic threats. Priority areas include:

- $2.5 billion over three years for *Project BioShield,* an initiative that encourages the development and procurement of next-generation medical countermeasures against WMD agents.
- $568 million to improve *food and agriculture defense* through R&D in the U.S. Department of Agriculture, the Department of Health and Human Services and the Department of Homeland Security.
- $23 million for R&D in EPA for enhanced methods for detecting biological and chemical agents intentionally introduced in drinking water and waste water systems and methods for safe disposal of waste materials resulting from cleanups.
- $340 million in the Department of Defense, for R&D to address terrorist and other unconventional threats. Systems and technologies under development to address defense against chemical or biological agents include: improved detectors of chemical and biological threats; troop protective gear for use under chemical and biological attack that is both more effective and more comfortable; and vaccines to protect against biological agents.

MANAGING THE FEDERAL RESEARCH BUDGET

R&D is critically important for keeping our nation economically competitive, and it will help solve the challenges we face in health, defense, energy, and the environment. As a result, and consistent with the Government Performance and Results Act, every federal R&D dollar must be invested as effectively as possible.

As directed by the President's Management Agenda, the R&D Investment Criteria were first applied in 2001 to selected R&D programs at DOE. Through the lessons learned from that DOE pilot program, the criteria were subsequently broadened in scope to cover other types of R&D programs at DOE and other agencies. To accommodate the wide range of R&D activities, a new framework was developed for the criteria to address three fundamental aspects of R&D:

- *Relevance*—Programs must be able to articulate why they are important, relevant, and appropriate for federal investment;
- *Quality*—Programs must justify how funds will be allocated to ensure quality; and
- *Performance*—Programs must be able to monitor and document how well the investments are performing.

In addition, R&D projects and programs relevant to industry are expected to meet criteria to determine the appropriateness of the public investment, enable compari-

sons of proposed and demonstrated benefits, and provide meaningful decision points for completing or transitioning the activity to the private sector.

OSTP and OMB are continuing to assess the strengths and weaknesses of R&D programs across the Federal Government in order to identify and apply good R&D management practices throughout the government.

CONCLUSION

Mr. Chairman and Members of the Committee, I believe this is a good budget for science and technology. This Administration is committed to strong science and technology as a foundation for national security and economic strength. I would be pleased to respond to questions.

BIOGRAPHY FOR JOHN H. MARBURGER III

John H. Marburger III, Science Adviser to the President and Director of the Office of Science and Technology Policy, was born on Staten Island, N.Y., grew up in Maryland near Washington, D.C., and attended Princeton University (B.A., Physics 1962) and Stanford University (Ph.D., Applied Physics 1967). Before his appointment in the Executive Office of the President, he served as Director of Brookhaven National Laboratory from 1998, and as the third President of the State University of New York at Stony Brook (1980–1994). He came to Long Island in 1980 from the University of Southern California where he had been a Professor of Physics and Electrical Engineering, serving as Physics Department Chairman and Dean of the College of Letters, Arts and Sciences in the 1970's. In the fall of 1994 he returned to the faculty at Stony Brook, teaching and doing research in optical science as a University Professor. Three years later he became President of Brookhaven Science Associates, a partnership between the university and Battelle Memorial Institute that competed for and won the contract to operate Brookhaven National Laboratory.

While at the University of Southern California, Marburger contributed to the rapidly growing field of nonlinear optics, a subject created by the invention of the laser in 1960. He developed theory for various laser phenomena and was a co-founder of the University of Southern California's Center for Laser Studies. His teaching activities included "Frontiers of Electronics," a series of educational programs on CBS television.

Marburger's presidency at Stony Brook coincided with the opening and growth of University Hospital and the development of the biological sciences as a major strength of the university. During the 1980's federally sponsored scientific research at Stony Brook grew to exceed that of any other public university in the northeastern United States.

During his presidency, Marburger served on numerous boards and committees, including chairmanship of the governor's commission on the Shoreham Nuclear Power facility, and chairmanship of the 80 campus "Universities Research Association" which operates Fermi National Accelerator Laboratory near Chicago. He served as a trustee of Princeton University and many other organizations. He also chaired the highly successful 1991/92 Long Island United Way campaign.

As a public spirited scientist-administrator, Marburger has served local, State and Federal Governments in a variety of capacities. He is credited with bringing an open, reasoned approach to contentious issues where science intersects with the needs and concerns of society. His strong leadership of Brookhaven National Laboratory following a series of environmental and management crises is widely acknowledged to have won back the confidence and support of the community while preserving the Laboratory's record of outstanding science.

Chairman BOEHLERT. Thank you very much, Dr. Marburger. And I want to thank you publicly, not just because you are a New Yorker, but for your invaluable service. And it is refreshing to see you, as the Science Advisor to the President, in the deliberations when OMB makes some of the difficult decisions it makes. And so I want to thank you for what you have done.

Dr. Colwell.

STATEMENT OF DR. RITA R. COLWELL, DIRECTOR, NATIONAL SCIENCE FOUNDATION

Dr. COLWELL. Mr. Chairman and Ranking Member Gordon, Members of the Committee, I am very pleased to appear before you

today. It has been an honor to serve as the NSF Director, and especially to work with you, Mr. Chairman, and with this committee. I will assume the Chairmanship of Canon USA Life Sciences subsidiary to develop genomic diagnostics, and I will also serve as distinguished University of Maryland professor and jointly at the Johns Hopkins University School of Public Health to focus on global infectious diseases, safe water, and human health. So I am going to be pretty busy once I leave NSF.

Let me speak now to the National Science Foundation's commitment to the science and engineering enterprise. It comes from a very strong conviction that knowledge is the most powerful force for progress. NSF works hard to open new frontiers in research and education, and we keep our eye on the biggest prize, which is economic and social prosperity, and very importantly, security benefiting all citizens.

The most powerful mechanism for keeping our nation prosperous and secure is keeping it at the forefront of learning and discovery. That is NSF's business, to advance fundamental research in science and engineering, to educate and train scientists and engineers, and to provide the tools to accomplish both of these objectives.

So first, the big picture. This year, the National Science Foundation is requesting $5.745 billion. That is an increase of $167 million, or three percent more than last year. In spite of the significant challenges that are facing our nation in security, defense, and the economy, NSF is, relatively speaking, doing well. An increase of three percent when many agencies are looking at budget cuts is, I think, a vote of confidence in the Foundation's working toward two of the Nation's goals.

NSF has been growing surely and steadily. Our investments this year will continue us on the right path. We are grateful for the leadership and the vision of this committee, and we believe that will help keep us moving in the right direction.

Now, having said that, in a year of very tight budgets, we had to set priorities. We had to make informed, but very tough choices. And that is never an easy job, and it is particularly difficult when the opportunities to make productive investments are as plentiful as they are today in research and education. The largest dollar increase is in the Research and Related Activities account: $201 million, that is five percent above the fiscal year 2004 level. The largest decrease is in the budget for the Education and Human Resources directorate, with the major share of the decrease due to the consolidation of the Math and Science Partnership with the Department of Education.

Nevertheless, we are increasing investments in people, science and engineering students, researchers, as well as public understanding and diversity participation in science and engineering throughout all of the directorates as part of our strategy for horizontal and vertical integration of all of our programs.

I am going to begin with our investment in organizational excellence. This is NSF's single greatest need for the coming year. In fiscal year 2005, we are requesting an increased investment of $76 million to ensure that we continue to make the productive investments wisely and efficiently and to perform even better in the fu-

ture and to remain the best managed agency in the entire Federal Government.

A number of considerations have elevated the organizational excellence portfolio in our budget. Let me point out that, for 20 years, NSF's staffing has remained level as the total budget and the workload increased significantly. And the work has become more complex. This investment will streamline and update NSF operations and management by allowing us to address the mounting workplace pressure, and it will allow us to add new skills to the workforce, and it will improve the quality and responsiveness for our customers.

Today's science and engineering challenges are more complex. Increasingly, they involve multi-investigation research as well as a strong emphasis on interdisciplinary research. So increasing award size and duration across the board remains one of NSF's top long-term priorities. We will make some additional progress in fiscal year 2005 with an increase in the average annual award. This will bring the total increase from $90,000 to $142,000 since 1998, an increase of 58 percent.

Our ability to attract the Nation's best talent has been facilitated by increasing the level of graduate stipends. This has gone from a base of $15,000 in 1999 to $30,000 today, and I thank you, all of you, for your support in achieving that goal. In fiscal year 2005, we will increase the number of fellowships from 5,000 to 5,500 for the NSF flagship Graduate Education programs, which, I might add, require U.S. citizenship.

NSF's five focused priority areas are also slated to receive more than $537 million in 2005. As the lead agency in the Administration's National Nanotechnology Initiative, support for Nanoscale Science and Engineering will increase by 20 percent to $305 million. Support for Biocomplexity in the Environment and the Mathematical Sciences will continue at the 2004 levels.

The Human and Social Dynamics priority area will provide $23 million to investigate the impacts of change on our lives and on the stability of our institutions, with a special emphasis on the way people make decisions and how they take risks. The budget includes $20 million to start NSF's Workforce for the 21st Century priority. This is critical, because it focuses on U.S. citizens and broadening participation.

Researchers need access to cutting-edge tools to tackle today's complex and radically different research. The fiscal year 2005 investment in tools is $1.5 billion. It is an increase of $104 million. It continues an accelerated program to revitalize and to upgrade the Nation's aging research infrastructure through investments in cutting-edge tools of every kind. Nearly $400 million of that investment in tools will support the expansion of a state-of-the-art cyberinfrastructure, and I know this is something, Mr. Chairman, you believe in very strongly.

So, Mr. Chairman, I conclude my remarks by emphasizing, once again, how carefully and diligently we work together at NSF to identify clear priorities in a time of very tight budgets, and we made tough choices. We are confident that the NSF's fiscal year 2005 investments will have long-term benefits for the entire science and engineering community and will contribute to the security and

the prosperity for our nation. And that is precisely why I have no doubt that NSF's budget merits the attention and the support that your NSF Authorization Act gave us.

Mr. Chairman, I would be happy to answer any questions that you may have.

[The prepared statement of Dr. Colwell follows:]

PREPARED STATEMENT OF RITA R. COLWELL

Chairman Boehlert, Ranking Member Gordon, Members of the Committee, I am pleased to appear before you today. For more than fifty years, the National Science Foundation (NSF) has been a strong steward of America's science and engineering enterprise. Although NSF represents roughly three percent of the total federal budget for research and development, it accounts for one-fifth of all federal support for basic academic research and 40 percent of support for basic research at academic institutions, outside of the life sciences. Despite its small size, NSF has an extraordinary impact on scientific and engineering knowledge and capacity.

During NSF's five decades of leadership, ground-breaking advances in knowledge have helped reshape society and enabled the United States to become the most productive nation in history. The returns on NSF's strategic investments in science, engineering, and mathematics research and education have been enormous. Much of the sustained economic prosperity America has enjoyed over the past decade is the result of technological innovation—innovation made possible, in large part, by NSF support for fundamental research and education.

In our 21st century world, knowledge is the currency of everyday life, and at the National Science Foundation we are in the knowledge business. Our investments are aimed at the frontiers of science and engineering, where advances in fundamental knowledge drive innovation, progress, and productivity.

Our commitment to the science and engineering enterprise comes from an abiding belief that knowledge is a powerful force for progress. As we work to open new frontiers in research and education, we have our eye on the main prize—economic and social prosperity that can improve the quality of life for all.

The surest way to keep our nation prosperous and secure is to keep it at the forefront of learning and discovery. That is NSF's business—to educate and train scientists and engineers, advance fundamental research and engineering, and provide the tools to accomplish both. The NSF FY 2005 budget request aims to do that, and I am pleased to present it to you today.

I'll begin with the big picture. This year the National Science Foundation is requesting $5.745 billion dollars. That's an increase of $167 million, or three percent more than in the FY 2004 enacted level.

In light of the significant challenges that face the Nation—in security, defense, and the economy—NSF has, relatively speaking, fared well. We are pleased to be able to anticipate an increase of three percent when many agencies are looking at budget cuts. This is certainly a vote of confidence in the National Science Foundation's stewardship of these very important components of the Nation's goals. Let me put the three percent increase in context.

NSF has been growing—surely and steadily. Our investments this year will continue us on the right path, and with the leadership and vision of this committee, the NSF Authorization Act will keep us moving in the right direction in the years to come.

Nonetheless, in a year of very tight budgets, we have had to set priorities and make informed choices in a sea of opportunity and constraint. That is never an easy job, but it is particularly difficult when opportunities to make productive investments are as plentiful as they are today in research and education.

The NSF FY 2005 Budget Request addresses these opportunities and challenges through an integrated portfolio of investments in People, Ideas, Tools, and Organizational Excellence. The NSF budget identifies what we see as NSF's most pressing needs during the coming year:

- *Strengthen NSF management to maximize effectiveness and performance.* The FY 2005 Request assigns highest priority to strengthening management of the investment process and operations. The budget request includes an increase of over $20 million to strengthen the NSF workforce and additional investments of over $50 million to enhance information technology infrastructure, promote leading-edge approaches to e-Government, and ensure adequate safety and security for all of NSF's information technology and physical resources. It's a sizable increase, especially in a constrained environment, but

it's really the minimum needed to keep pace with our growing workload and expanding responsibilities.

- *Improve the productivity of researchers and expand opportunities for students.* Boosting the overall productivity of the Nation's science and engineering enterprise requires increasing average award size and duration. The recent survey of NSF-funded principal investigators provides convincing evidence that an increase in award size will allow researchers to draw more students into the research process, and increasing award duration will foster a more stable and productive environment for learning and discovery. The level proposed for FY 2005 represents a 58 percent increase over the past seven years in average annual award size.
- *Strengthen the Nation's performance with world-class instruments and facilities.* In an era of fast-paced discovery and technological change, researchers need access to cutting-edge tools to pursue increasingly complex avenues of research. NSF investments not only provide these tools, but also develop and creatively design the tools critical to 21st Century research and education. Consistent with the recent recommendations of the National Science Board, investment in infrastructure of all types (Tools) rises to $1.47 billion, representing 26 percent of the FY 2005 Budget Request.

Targeted investments under each of NSF's four strategic goals will promote these objectives and advance the progress of science and engineering.

NSF Strategic Goals: People, Ideas, Tools and Organizational Excellence

The National Science Foundation supports discovery, learning and innovation at the frontiers of science and engineering, where risks and rewards are high, and where benefits to society are most promising. NSF encourages increased and effective collaboration across disciplines and promotes partnerships among academe, industry and government to ensure that new knowledge moves rapidly and smoothly throughout the public and private sectors.

NSF's investment strategy establishes a clear path of progress for achieving four complementary strategic goals: People, Ideas, Tools and Organizational Excellence. "People, Ideas and Tools" is simple shorthand for a sophisticated system that integrates education, research, and cutting-edge infrastructure to create world-class discovery, learning and innovation in science and engineering. Organizational Excellence (OE)—a new NSF strategic goal on a par with the other three—integrates what NSF accomplishes through People, Ideas and Tools with business practices that ensure efficient operations, productive investments and real returns to the American people.

People. The rapid transformations that new knowledge and technology continuously trigger in our contemporary world make investments in people and learning a continuing focus for NSF. In our knowledge-based economy and society, we need not only scientists and engineers, but also a national workforce with strong skills in science, engineering and mathematics. Yet many of today's students leave secondary school without these skills. Fewer young Americans choose to pursue careers in science and engineering at the university level. Of those that do, fewer than half graduate with science or engineering degrees. The FY 2005 Request provides $1.065 billion for programs that will address these challenges.

To capture the young talent so vital for the next generation of discovery, we will increase the number of fellowships from 5,000 to 5,500 for NSF's flagship graduate education programs: the Integrative Graduate Education and Research Traineeships (IGERT), Graduate Research Fellowships (GRF), and Graduate Teaching Fellows in K–12 Education (GK–12).

Ideas. New knowledge is the lifeblood of the science and engineering enterprise. Investments in Ideas are aimed at the frontiers of science and engineering. They build the intellectual capital and fundamental knowledge that drive technological innovation, spur economic growth and increase national security. They also seek answers to the most fundamental questions about the origin and nature of the universe, the planet and humankind. Investments totaling $2.85 billion in FY 2005 will support the best new ideas generated by the science and engineering community.

Increasing grant size and duration is a fundamental, long-term investment priority for NSF. Larger research grants of longer duration will boost the overall productivity of researchers by freeing them to take more risks and focus on more complex research goals with longer time horizons. More flexible timetables will also provide researchers with opportunities to provide expanded education and research experiences to students. Investments in FY 2005 bring NSF average annual research grant award size to approximately $142,000, an increase of $3,000 over FY 2004—

a 58 percent increase since 1998. Average annual award duration will continue at approximately 3.0 years.

Tools. The FY 2005 request for Tools totals $1.47 billion, an increase of $104 million over the FY 2004 Estimate. The increase continues an accelerated program to revitalize and upgrade the Nation's aging infrastructure through broadly distributed investments in instruments and tools. Progress in research and education frequently depends upon the development and use of tools that expand experimental and observational limits. Researchers need access to cutting-edge tools to tackle today's complex and radically different avenues of research, and students who are not trained in their use are at a disadvantage in today's technology-intensive workplace.

Organizational Excellence (OE). With activities that involve over 200,000 scientists, engineers, educators and students and with over 40,000 proposals to process each year, NSF relies on efficient operations and state-of-the-art business practices to provide quality services and responsible monitoring and stewardship of the agency's investments. NSF's Request includes $363.05 million to support Organizational Excellence (OE). This represents an increase in the share of the total NSF budget for OE from five percent in FY 2004 to six percent in FY 2005.

A number of considerations have elevated the Organizational Excellence portfolio in NSF's FY 2005 Request. For twenty years NSF staffing has remained level as the total budget and workload increased significantly, and the work has become more complex. Proposals increasingly involve large, multidisciplinary and interdisciplinary projects and require sophisticated monitoring and evaluation. NSF is also committed to maintaining its traditional high standards for stewardship, innovation and customer service. Key priorities for FY 2005 include award monitoring and oversight, human capital management and IT system improvements necessary for leadership in e-Government, security upgrades and world-class customer service.

It is central to NSF's mission to provide effective stewardship of public funds, to realize maximum benefits at minimum cost and to ensure public trust in the quality of the process. The FY 2005 investment in Organizational Excellence will streamline and update NSF operations and management by enhancing cutting edge business processes and tools. It will also fund the addition of 25 new permanent employees to address mounting workplace pressure, add new skills to the workforce and improve the quality and responsiveness of customer service.

Of course, People, Ideas, Tools, and Organizational Excellence work together to give us the best returns in discovery, learning and innovation.

Priority Areas

Before providing a few highlights of the budget, let me stress that the priority-setting process at NSF results from continual consultation with the research community. New programs are added or enhanced only after seeking the combined expertise and experience of the science and engineering community, NSF management and staff, and the National Science Board.

Programs are initiated or enlarged based on considerations of their intellectual merit, broader impacts of the research, the importance to science and engineering, balance across fields and disciplines, and synergy with research in other agencies and nations. NSF coordinates its research with our sister research agencies both informally—by program officers being actively informed of other agencies' programs—and formally, through interagency agreements that spell out the various agency roles in research activities. Moreover, through our Committee of Visitors process there is continuous evaluation and feedback of information about how NSF programs are performing.

Producing the finest scientists and engineers in the world and encouraging new ideas to strengthen U.S. leadership across the frontiers of discovery are NSF's principal goals. NSF puts its money where it counts—94 percent of our budget goes directly to the research and education that keep our knowledge base strong, our economy humming and the benefits to society flowing.

Our nation's science and engineering workforce is the most productive in the world. To keep it that way, we have to attract more of the most promising students to graduate-level studies in science and engineering.

Since our founding in 1950, NSF has supported 39,000 fellows. We will increase Fellowships from 5,000 to 5,500 for NSF's prestigious graduate education programs: the Integrative Graduate Education and Research Traineeships (IGERT), Graduate Research Fellowships (GRF), and Graduate Teaching Fellows in K–12 Education (GK–12).

Our ability to attract the Nation's best talent has been facilitated by increasing the level of graduate stipends from a base of $15,000 in 1999 to $30,000 in FY 2004. Stipend levels will remain at the $30,000 level in FY 2005.

Today's science and engineering challenges are more complex. Increasingly, they involve multi-investigator research, as well as a strong emphasis on interdisciplinary research. So, increasing award size and duration-across the board-remains one of NSF's top long-term priorities. We will make additional progress in FY 2005 with an increase of $3,000 in average annual award. That brings the total increase to 58 percent since 1998.

Opportunities to advance knowledge have never been greater than they are today. NSF invests in emerging areas of research that hold exceptional potential to strengthen U.S. world leadership in areas of global economic and social importance. This year, we are requesting funding for five priority areas with very promising research horizons: biocomplexity, nanoscale science and engineering, mathematical sciences, human and social dynamics, and the 21st century workforce.

Biocomplexity in the Environment explores the complex interactions among organisms and their environments at all scales, and through space and time. This fundamental research on the links between ecology, diversity, the evolution of biological systems, and many other factors will help us better understand and, in time, predict environmental change. In FY 2005, Biocomplexity in the Environment will emphasize research on aquatic systems.

The Human and Social Dynamics priority area will explore a wide range of topics. These include individual decision-making and risk, the dynamics of human behavior, and global agents of change—from democratization, to globalization, to war. Support will also be provided for methodological capabilities in spatial social science and for instrumentation and data resources infrastructure.

Mathematics is the language of science, and is a powerful tool of discovery. The Mathematical Sciences priority areas will focus on fundamental research in the mathematical and statistical sciences, interdisciplinary research connecting math with other fields of science and engineering, and targeted investments in training.

NSF's investment in Nanoscale Science and Engineering targets the fundamental research that underlies nanotechnology—which very likely will be the next "transformational" technology.

Investments in this priority area will emphasize research on nanoscale structures and phenomena, and quantum control. NSF is the lead agency for the government-wide National Nanotechnology Initiative (NNI). NSF is requesting $305 million, an increase of nearly $52 million or 20 percent. This is by far NSF's largest priority area investment.

To operate in an increasingly complex world, we have to produce a general workforce that is scientifically and technologically capable, and a science and engineering workforce that is world class by any measure.

The FY 2005 request provides $20 million to initiate the Workforce for the 21st Century priority area. This investment will support innovations to integrate NSF's investments in education at all levels, from K–12 through postdoctoral, as well as attract more U.S. students to science and engineering fields and broaden participation.

Budget Highlights

Every year it becomes more difficult to choose only a few NSF activities to highlight in the budget presentation. But they are all genuinely significant, and I want to make brief comments about each.

In FY 2005, NSF will make significant investments in our diverse Centers Programs. Centers bring people, ideas, and tools together on scales that are large enough to have a significant impact on important science and engineering challenges. They provide opportunities to integrate research and education, and to pursue innovative and risky research. An important goal beyond research results is developing leadership in the vision, strategy, and management of the research and education enterprise. The total investment for NSF's Centers Programs is $457 million, an increase of $44 million in FY 2005. Here are some highlights of the Centers.

- $30 million will initiate a new cohort of six Science and Technology Centers. A key feature of these centers is the development of partnerships linking industry, government, and the educational community to improve the transfer of research results, and provide students a full set of boundary-crossing opportunities.
- $20.0 million will continue support for multidisciplinary, multi-institutional Science of Learning Centers. These centers are intended to advance understanding of learning through research on the learning process, the context of learning, and learning technologies. The Centers will strengthen the connections between science of learning research and educational and workforce development.

- The budget request provides for two new nanotechnology centers; two or three centers that advance fundamental knowledge about Environmental Social and Behavioral Science; three Information Technology Centers, and additional funding for the NSF Long-Term Ecological Research network. An additional $6 million will fund a number of mathematical and physical science centers, including: Chemistry Centers, Materials Centers, Mathematical Sciences Research Institutes, and Physics Frontiers Centers.

Today, discoveries emerge from around the world. It is essential that American scientists and engineers have opportunities to engage with the world's top researchers, to lead major international collaborations, and to have access to the best research facilities throughout the world and across all the frontiers of science and engineering. The FY 2005 budget to carry out these activities through NSF's Office of International Science and Engineering is $34 million, an increase of $6 million, or 21 percent over the FY 2004 estimate.

Finally, NSF will initiate an Innovation Fund at $5 million. The Fund provides an opportunity for the Foundation to respond quickly to rapidly emerging activities at the frontiers of learning and discovery.

Tools—Opening Up New Vistas

Researchers need access to cutting-edge tools to tackle today's complex and radically different research tasks. If students are not trained in their use, they will be at a disadvantage in today's technology-intensive workplace. The FY 2005 investment in Tools totals one and a half billion dollars, an increase of $104 million. This continues an accelerated program to revitalize and upgrade the Nation's aging research infrastructure through investments in cutting-edge tools of every kind.

Nearly $400 million of the FY 2005 investment supports the expansion of state-of-the-art cyberinfrastructure. Our new information and communication technologies have transformed the way we do science and engineering. Providing access to moderate-cost computation, storage, analysis, visualization and communication for every researcher will make that work more productive and broaden research perspectives throughout the science and engineering community.

In FY 2005, there are three continuing and three new projects funded by the proposed $213 million investment in Major Research Equipment and Facilities Construction.

NEON, the National Ecological Observatory Network, is a continental scale research instrument with geographically distributed infrastructure, linked by state-of-the-art networking and communications technology. NEON will facilitate studies that can help us address major environmental challenges and improve our ability to predict environmental change. Funding for NEON planning activities is included in the FY 2004 estimate.

The Scientific Ocean Drilling Vessel is a state-of-the-art drill ship that will be used by the Integrated Ocean Drilling Program (IODP), an international collaboration. Cores of sediment and rock collected from the ocean floor will enhance studies of the geologic processes that modify our planet. Investigators will explore the history of those changes in oceans and climate, and the extent and depth of the planet's biosphere.

The Rare Symmetry Violating Processes (RSVP) includes two highly sensitive experiments to study fundamental symmetries of nature. RSVP will search for the particles or processes that explain the predominance of matter that makes up the observable universe. It will focus on questions ranging from the origins of our physical world to the nature of dark matter.

NSF plans to invest in major research equipment and facilities construction projects over the next several years. We expect to start funding for two additional projects; Ocean Observatories and an Alaska Regional Research Vessel in FY 2006.

In making these critical investments, NSF continues to put a very strong emphasis on effective and efficient management. We are proud of our track record.

Conclusion

Mr. Chairman, the budget highlights I've just presented don't even begin to portray the variety and richness of the NSF portfolio. We support research programs to enhance homeland security. This includes the Ecology of Infectious Diseases program, jointly funded with NIH, and the Microbial Genome Sequencing program, jointly funded with the Department of Agriculture. NSF participates on the National Interagency Genome Sequencing Coordinating Committee, where our programs have attracted a great deal of interest from the intelligence community, and have been touted as the best. The Critical Infrastructure Protection program, and cyber security research and education round out our important contributions to enhancing homeland security.

Additionally, as part of the Administration's Climate Change Research Initiative, NSF supports research to reduce uncertainty related to climate variability and change, with the objective of facilitating decision making and informing the policy process.

Let me conclude my remarks by emphasizing once again how carefully and diligently we worked together at NSF to identify clear priorities in a time of tight budgets. We are confident that NSF's FY 2005 investments will have long-term benefits for the entire science and engineering community, and contribute to security and prosperity for all. That is precisely why I have no doubts that NSF's budget merits the attention and support that your NSF Authorization Act gave us.

Mr. Chairman and Members of the Committee, I hope that this brief overview conveys to you the extent of NSF's commitment to advancing science and technology in the national interest.

I ask not only for your support for our FY 2005 budget request, but also want you to know how much I appreciate the long-standing bipartisan support of the committee for NSF. Mr. Chairman, I would ask to include a copy of NSF's budget summary as part of my testimony, and would be happy to answer any questions that you have.

BIOGRAPHY FOR RITA ROSSI COLWELL

Dr. Rita R. Colwell became the 11th Director of the National Science Foundation on August 4, 1998. Since taking office, Dr. Colwell has spearheaded the agency's emphases in K–12 science and mathematics education, graduate science and engineering education/training and the increased participation of women and minorities in science and engineering.

Her policy approach has enabled the agency to strengthen its core activities, as well as establish major initiatives, including Nanotechnology, Biocomplexity, Information Technology, Social, Behavioral and Economic Sciences and the 21st Century Workforce. In her capacity as NSF Director, she serves as Co-chair of the Committee on Science of the National Science and Technology Council.

Before coming to NSF, Dr. Colwell was President of the University of Maryland Biotechnology Institute, 1991–1998, and she remains Professor of Microbiology and Biotechnology (on leave) at the University Maryland. She was also a member of the National Science Board (NSF's governing body) from 1984 to 1990.

Dr. Colwell has held many advisory positions in the U.S. Government, non-profit science policy organizations, and private foundations, as well as in the international scientific research community. She is a nationally respected scientist and educator, and has authored or co-authored 16 books and more than 600 scientific publications. She produced the award-winning film, *Invisible Seas,* and has served on editorial boards of numerous scientific journals.

She is the recipient of numerous awards, including the Medal of Distinction from Columbia University, the Gold Medal of Charles University, Prague, and the University of California, Los Angeles, and the Alumna Summa Laude Dignata from the University of Washington, Seattle.

Dr. Colwell has also been awarded 35 honorary degrees from institutions of higher education, including her Alma Mater, Purdue University. Dr. Colwell is an honorary member of the microbiological societies of the UK, France, Israel, Bangladesh, and the U.S. and has held several honorary professorships, including the University of Queensland, Australia. A geological site in Antarctica, Colwell Massif, has been named in recognition of her work in the polar regions.

Dr. Colwell has previously served as Chairman of the Board of Governors of the American Academy of Microbiology and also as President of the American Association for the Advancement of Science, the American Society for Microbiology, the Sigma Xi National Science Honorary Society, and the International Union of Microbiological Societies. Dr. Colwell is a member of the American Academy of Arts and Sciences, the American Philosophical Society, and the National Academy of Sciences.

Born in Beverly, Massachusetts, Dr. Colwell holds a B.S. in Bacteriology and an M.S. in Genetics, from Purdue University, and a Ph.D. in Oceanography from the University of Washington.

Chairman BOEHLERT. Thank you very much, Dr. Colwell. Thank you for highlighting some of the positives.

Dr. McQueary.

STATEMENT OF DR. CHARLES E. McQUEARY, UNDER SECRETARY FOR SCIENCE AND TECHNOLOGY, DEPARTMENT OF HOMELAND SECURITY

Dr. MCQUEARY. Chairman Boehlert, Members of the Committee——

Chairman BOEHLERT. Turn on your mike.

Dr. MCQUEARY. There we go. It looked green, but it was not on. Pardon me.

Chairman Boehlert and Congressman Gordon and distinguished Members of the Committee, it is a pleasure to be here with you today to discuss the research and development activities of the Department of Homeland Security's Science and Technology Directorate. And, Mr. Chairman, I would like to thank you for the very generous remarks you made about me personally, as well as the men and women that I am fortunate enough to lead in the Science and Technology Directorate. I greatly appreciate that.

I also want to recognize and thank my colleagues from the Office of Science and Technology Policy, the Department of Energy, the Department of Commerce, and the National Science Foundation for the essential role their organizations have in advancing this Nation's scientific knowledge and for the strong support they have provided to us as we have stood up the Science and Technology Directorate.

The Nation's advantage in science and technology is key to securing the homeland. The most important mission for the Science and Technology Directorate is to allow the dedicated men and women who protect and secure our homeland to perform their jobs more effectively and efficiently. These men and women I view as my customers and the customers of the Science and Technology Directorate.

When I first reported to you about our activities last year, we had just begun our work. The Science and Technology Directorate has accomplished much since its inception last March, and I would like to give you a few highlights.

We have deployed monitoring systems that operate continuously to detect biological pathogens in approximately 30 U.S. cities. We have also set up testbeds to provide accurate radiation and nuclear warnings at air and marine cargo ports in cooperation with the Port Authority of New York and New Jersey. We have established the first series of inter-operability guidelines for the Nation's wireless emergency communications network. In another effort, we have greatly reduced the time it takes to develop national standards for technologies to protect the homeland, and our new standards for radiation detection equipment will help put needed technologies into the hands of first responders quickly. And the Homeland Security Advanced Research Project Agency has started extensive research for our next generation of biological and chemical and radiological and nuclear detectors. We have awarded the first round of 100 Homeland Security Fellowships and Scholarships to help build the U.S. leadership in science and technology. We have also established the first university-based Homeland Security Centers of Excellence to address both the targets and means of terrorism. And finally, we have become active contributors in numerous interagency Working Groups.

In accomplishing this, we have doubled the staff of this Directorate with some of the country's best and most dedicated people. We started this Directorate last March with 87 people, and 53 of those are actually in a laboratory in Manhattan in our Environmental Measurements Lab, so we had a very small staff to begin. Today, we have more than 210 people.

However, the threats to our homeland are diverse and remain daunting. We must constantly monitor current and emerging threats and assess our vulnerabilities to them, and we must develop new and improved capabilities to counter them and respond to and recover from potential attack.

The Science and Technology Directorate has prioritized its research and development efforts based on the directives, recommendations, and suggestions from many sources, including the *Homeland Security Act of 2002,* President Bush's National Strategies and nine Homeland Security Presidential Directives, the report from the National Academies of Sciences on *Making the Nation Safer,* and reports from the Gilmore, Bremer, and Hart-Rudman Committees.

Identifying and integrating the information contained in these sources has not been a small task, but the result, coupled with the expert evaluation and judgment by our Science and Technology scientific staff, is the basis for determining the R&D needed to meet our mission.

We recognize that many organizations, such as those represented here today, are contributing to the Homeland Security Science and Technology base. In the *Homeland Security Act of 2002,* Congress recognized this as well and directed that the Under Secretary of Science and Technology coordinate the Federal Government's civilian efforts to identify and develop countermeasures to current and emerging threats.

We take this responsibility very seriously.

We began this coordination process by evaluating and producing a report on the Department of Homeland Security R&D activities underway that were not under the direct cognizance of the Science and Technology Directorate. Where appropriate, Science and Technology will absorb these R&D functions.

We are now initiating the effort needed to coordinate Homeland Security research and development across the entire United States Government. Discussions are ongoing with federal departments and agencies as well as with the Office of Management and Budget, the Office of Science and Technology Policy, and the Homeland Security Council to ensure that the strongest possible links are made and the best possible coordination occurs.

At this time, I would like to briefly describe our fiscal year 2005 plans. We have an overall budget request of $1.04 billion, which is an increase of $126.5 million, or a 13.9 percent increase over the fiscal year 2004 levels. With these funds, Science and Technology will continue to make progress in securing the homeland. For example, under President Bush's new Biosurveillance Initiative, which accounts for most of the increase in funding, additional capability will be implemented quickly in the top-threat urban areas to provide more than twice the current capability.

Also during fiscal year 2005, we expect to continue our annual awarding of scholarships and fellowships, and we will continue with our University Centers of Excellence, each focusing on a different aspect of terrorism. We will wrap up our work on the Counter-MANPADS, or the Man-Portable Air Defense Shoulder-fired missiles, to improve technologies to protect commercial aircraft. We will award contracts in 2005 for integrating commercial prototype equipment on selected commercial aircraft and conduct tests and evaluations, including live-fire range tests.

With less than a full year completed, the scientists and engineers in the Science and Technology Directorate have accomplished more than I could have expected, and I am proud to have shared with you some of those success stories we have today, and I have appended a more comprehensive summary of those accomplishments for the record. And yet, we also recognize there is much to do, and we will be working just as hard in fiscal year 2005. I look forward to working with you in the Science Committee, with my colleagues here today and private industry to continue this work and improve our ability to protect the homeland.

This concludes my prepared statement.

[The prepared statement of Dr. McQueary follows:]

PREPARED STATEMENT OF CHARLES E. MCQUEARY

Opening Statement

Good morning. Chairman Boehlert, Congressman Gordon, and distinguished Members of the committee, it is a pleasure to be with you today to discuss the research and development activities of the Department of Homeland Security's Science and Technology Directorate.

I also want to recognize and thank my colleagues from the Office of Science and Technology Policy, the Department of Energy, the Department of Commerce, and the National Science Foundation for the essential role their organizations have in advancing this nation's scientific knowledge—and for the strong support they have provided to us as we have stood up the Science and Technology Directorate.

The Nation's advantage in science and technology is key to securing the homeland. The most important mission for the Science and Technology Directorate is to allow the dedicated men and women who protect and secure our homeland to perform their jobs more effectively and efficiently—these men and women are my customers.

When I first reported to you about our activities last year, we had just begun our work. The Science and Technology Directorate has accomplished much since its inception last March. I'd like to give you some highlights:

- We have deployed monitoring systems that operate continuously to detect biological pathogens in approximately 30 U.S. cities.
- We have also set up testbeds to provide accurate radiation and nuclear warnings at air and marine cargo ports in cooperation with the Port Authority of New York and New Jersey.
- We have established the first series of inter-operability guidelines for the Nation's wireless emergency communications network.
- In another effort, we have greatly reduced the time it takes to develop national standards for technologies to protect the homeland—our new standards for radiation detection equipment will help put needed technologies into the hands of first responders—quickly.
- And HSARPA—our Homeland Security Advanced Research Projects Agency—has started extensive research for next generation biological/chemical, and radiological/nuclear detectors.
- We have awarded the first round of 100 Homeland Security Fellowships and Scholarships to help build U.S. leadership in science and technology.
- We have also established the first university-based Homeland Security Centers of Excellence to address both the targets and means of terrorism.

- And we have become active contributors in numerous interagency working groups.

In accomplishing this, we have doubled the staff of this Directorate with some of this country's brightest and most dedicated people. We started this Directorate last March with 87 people. Today we have more than 210.

However, the threats to our homeland remain diverse and daunting. We must constantly monitor current and emerging threats and assess our vulnerabilities to them. And we must develop new and improved capabilities to counter them—and respond to and recover from a potential attack.

Prioritization

The Science and Technology Directorate has prioritized its research and development efforts based on the directives, recommendations and suggestions from many sources, including:

- Homeland Security Act of 2002;
- President Bush's National Strategies and nine Homeland Security Presidential Directives;
- The report from the National Academies of Sciences on *Making the Nation Safer,* and
- Reports from the Gilmore, Bremer and Hart-Rudman Committees.

Identifying and integrating the information contained in these sources has not been a small task. But the result—coupled with expert evaluation and judgment by our scientific staff—is the basis for determining the R&D needed to meet our mission.

Consolidation and Coordination

We recognize that many organizations, such as those represented here today, are contributing to the homeland security science and technology base. In the Homeland Security Act of 2002, Congress recognized this as well, and directed the Under Secretary of Science and Technology to coordinate the Federal Government's civilian efforts to identify and develop countermeasures to current and emerging threats.

We take this responsibility very seriously.

We began this coordination process by evaluating and producing a report on DHS R&D activities underway that were not under the direct cognizance of the Science and Technology Directorate. Where appropriate, S&T will absorb these R&D functions.

We are now initiating the effort needed to coordinate homeland security research and development across the entire United States Government. Discussions are ongoing with Federal Departments and Agencies, as well as the Office of Management and Budget, the Office of Science and Technology Policy and the Homeland Security Council to ensure that the strongest possible links are made and the best possible coordination occurs.

Budget Request

At this time I would like to briefly describe our FY 2005 plans. We have an overall budget request of $1.039.3 billion—which is an increase of $126.5 million or 13.9 percent over the FY 2004 levels.

With these funds, Science and Technology will continue to make progress in securing the homeland. For example,

- under President Bush's new Biosurveillance Initiative, which accounts for most of the increase in funding, additional capability will be implemented quickly in the top threat urban areas to provide more than twice the current capability.
- Also during FY 2005, we expect to continue our annual awarding of Scholarships and Fellowships. And we will continue with our University Centers of Excellence, each focusing on a different aspect of terrorism.
- We will ramp up our work in Counter-MANPADS to improve technologies to protect commercial aircraft from the threat of MAN-Portable Air Defense Systems. We will award contracts in FY 2005 for integrating commercial prototype equipment on selected commercial aircraft and conducting test and evaluation, including live fire range tests.

Conclusion

With less than a full year completed, the scientists and engineers in the Science and Technology Directorate have accomplished more than I could have expected. I

am proud to have shared with you today some of those success stories. We have appended a more comprehensive summary of accomplishments to date for the record.

And yet, we also recognize that there is much to do, and we will be working just as hard in FY 2005.

I look forward to working with you on the Science Committee—and with my colleagues here today and private industry to continue this work and improve our ability to protect our homeland and way of life.

This concludes my prepared statement. With the Committee's permission, I request my formal statement be submitted for the record. Mr. Chairman, Congressman Gordon and Members of the Committee, I thank you for your attention and will be happy to answer any questions you may have.

Introduction

Good morning. Chairman Boehlert, Congressman Gordon, and distinguished Members of the Committee, it is a pleasure to be with you today to discuss the research and development activities of the Department of Homeland Security's Science and Technology Directorate. I also want to recognize and thank my colleagues from the Office of Science and Technology Policy, the Department of Energy, the Department of Commerce, and the National Science Foundation for the essential role their organizations have in advancing this nation's scientific knowledge and for the strong support they have provided to us as we have stood up the Science and Technology Directorate.

The Nation's advantage in science and technology is key to securing the homeland. The most important mission for the Science and Technology Directorate is to develop and deploy cutting-edge technologies and new capabilities so that the dedicated men and women who serve to protect and secure our homeland can perform their jobs more effectively and efficiently - these men and women are my customers. When I last reported to you about our activities, we had just begun our work. It is now less than a year later.

Since its inception less than a year ago, the Science and Technology Directorate has:

1) deployed continuously operating biological pathogen detection systems to approximately 30 United States cities;
2) set up testbeds for radiation and nuclear warnings at air and marine cargo ports in cooperation with the Port Authority of New York and New Jersey,
3) established the first series of inter-operability guidelines for the Nation's wireless emergency communications network;
4) established the first national standards guidelines for radiation detection equipment;
5) awarded the first Homeland Security Fellowships and Scholarships;
6) established the first Homeland Security University Center of Excellence,
7) transferred the Plum Island Animal Disease Center from the Department of Agriculture to the Science and Technology Directorate;
8) engaged private industry in bringing innovative and effective solutions to homeland security problems through the Technical Support Working Group and issuance of HSARPA's first two Broad Agency Announcements and a Small Business Innovative Research Program solicitation;
9) initiated a development and demonstration program to assess the technical and economic viability of adapting military countermeasures to the threat of man portable anti-aircraft missiles for commercial aircraft;
10) collaborated with and assisted other components of the Department to enhance their abilities to meet their missions and become active contributors in interagency working groups—all while staffing this Directorate with some of this country's brightest and most dedicated people.

I continue to be energized by and proud of the scientists, managers, and support staff in the Science and Technology Directorate. We have accomplished a great deal in a short amount of time and are positioning the Directorate to make continuing contributions to the homeland security mission of the Department.

However, the threats to our homeland remain diverse and daunting. We must constantly monitor current and emerging threats and assess our vulnerabilities to them, develop new and improved capabilities to counter them, and mitigate the effects of terrorist attacks should they occur. The Science and Technology Directorate must also enhance the conventional missions of the Department to protect and provide assistance to civilians in response to natural disasters, law enforcement needs, and other activities such as maritime search and rescue.

Prioritization

The Science and Technology Directorate has prioritized its research and development (R&D) efforts based on the directives, recommendations and suggestions from many sources, including:

- *Homeland Security Act of 2002;*
- The FY 2004 Congressional Appropriations for the Department of Homeland Security;
- President Bush's National Strategy for Homeland Security, the National Strategy for the Physical Protection of Critical Infrastructure and Key Assets, the National Strategy to Combat Weapons of Mass Destruction, the National Strategy to Secure Cyberspace, and the National Security Strategy;
- President Bush's nine Homeland Security Presidential Directives;
- Office of Management and Budget's 2003 Report on Combating Terrorism;
- Current threat assessments as understood by the Intelligence Community;
- Requirements identified by other Department components;
- Expert understanding of enemy capabilities that exist today or that can be expected to appear in the future; and
- The report from the National Academies of Sciences on "Making the Nation Safer: The Role of Science and Technology in Countering Terrorism," and the reports from the Gilmore, Bremer and Hart-Rudman Committees.

Identifying and integrating the information contained in these sources has not been a small task, but the result, coupled with expert evaluation and judgment by our scientific staff, is the basis for determining the research and development (R&D) needed to meet our mission requirements.

Consolidation and Coordination

The Department of Homeland Security, Science and Technology Directorate recognizes that many organizations, such as those represented here today, are contributing to the science and technology base needed to enhance the Nation's capabilities to thwart terrorist acts and to fully support the conventional missions of the operational components of the Department. Congress recognized the importance of the research and development being conducted by numerous federal departments and agencies, and in the *Homeland Security Act of 2002,* directed the Under Secretary of Science and Technology to coordinate the Federal Government's civilian efforts to identify and develop countermeasures to current and emerging threats.

We take this responsibility very seriously.

We have begun this coordination process by evaluating and producing a report on the research, development, testing, and evaluation work that was being conducted within the Department of Homeland Security but was not already under the direct cognizance of the Science and Technology Directorate. Where it is appropriate, the Science and Technology Directorate will absorb these R&D functions. In other cases, the Science and Technology Directorate will provide appropriate input, guidance, and oversight of these R&D programs.

We are now initiating the effort needed to coordinate homeland security research and development across the entire United States Government. It will come as no surprise to the Members of this committee that good, solid, effective research and development relevant to homeland security is being conducted by the Departments of Agriculture, Commerce, Defense, Energy, Justice, Health and Human Services, State, and Veteran's Affairs; within the National Science Foundation, the Environmental Protection Agency and other federal agencies; and by members of the Intelligence Community.

Several interagency working groups already exist that are addressing issues important to homeland security. The Science and Technology Directorate has been, and continues to be, an active participant in these working groups, and in most cases has taken a leadership role. These fora foster an active exchange of information and assist each participating agency in identifying related needs and requirements, conducting research and development of mutual benefit, and avoiding duplication of effort.

We also continue to have discussions at multiple levels of management with Federal Departments and Agencies, as well as with the Office of Management and Budget, the Office of Science and Technology Policy, and the Homeland Security Council. These discussions ensure that the strongest possible links are made and the best possible coordination occurs between our Department and those who are conducting sector-specific research. By the autumn of 2004, all Department of Homeland Security research and development programs will be consolidated and all

United States Government research and development relevant to fulfilling the Department's mission will have been identified and coordinated as appropriate. It is important to note that this identification and relevant coordination does not imply the Department of Homeland Security should have the responsibility and authority for these programs within other federal agencies; it does recognize that science and technology advances can have many applications, including homeland security.

Definition of Research and Development (R&D)

The Science and Technology Directorate is both a generator and a consumer of scientific and technological advances resulting from basic and applied research and development. We also have a responsibility for testing and evaluating capabilities to ensure that their deployment results in improved operational systems. Standards are needed to assist first responders and operational components of the Department in evaluating, procuring, and deploying new capabilities. This is a broad range of responsibility and one we take seriously. The Department has defined R&D activities as follows:

> Activities associated with R&D efforts include the development of a new or improved capability to the point where it is appropriate for operational use, including test and evaluation. R&D activities include the analytic application of scientific and engineering principles in support of operational capabilities, concept exploration, systems development, proof of principle demonstration and pilot deployments, standards development, and product improvement including application and integration of technologies. For mission (non-management) systems, resources associated with developing technology to provide new capabilities (including systems engineering, research, development, testing and prototyping) are covered under the R&D category.

This definition encompasses all of the research, development, test, and evaluation (RDT&E) efforts of the Science and Technology Directorate.

Science and Technology Directorate Organization

Because our Department is relatively new, I'd like to describe the way we are structured. We have four key offices in the Science & Technology Directorate, each of which has an important role in implementing the Directorate's RDT&E activities. Individuals with strong credentials have been appointed to head each office and we continue to strategically add highly skilled technical, professional and support staff. These offices are: Plans, Programs and Budgets; Research and Development; Homeland Security Advanced Research Projects Agency; and Systems Engineering and Development. In addition, we have created the Office of Weapons of Mass Destruction Operations and Incident Management to offer scientific advice and support.

Crosscutting the four key offices, the Science and Technology Directorate is implementing its activities through focused portfolios that address biological, chemical, high explosives, radiological and nuclear, and cyber threats; support the research and development needs of the operational units of the Department; support the development of standards; develop an enduring R&D capability for homeland security; and receive valuable input from private industry and academia as well as national and federal laboratories. I will talk about the offices first and then about the portfolios.

Office of Plans, Programs and Budgets

The Office of Plans, Programs and Budgets operates under the supervision of Dr. Penrose Albright. He has organized this office into the portfolios I just mentioned, each of which is focused on a particular discipline or activity; taken together, these portfolios span the Directorate's mission space. As I will cover the portfolios in detail later in this testimony, I will limit myself here to a summary explanation. The staff of each portfolio is charged with being expert in their particular area; with understanding the activities and capabilities extant in federal agencies and across the broad research and development community; and with developing a strategic plan for their particular portfolio, to include near-, mid-, and long-range research and development activities. In addition, we have staff that is charged with understanding the threat from a technical perspective, with integrating the various portfolios into a coherent overall plan, and with developing the corresponding budget and monitoring its financial execution.

Finally, the Office of Plans, Programs and Budget is responsible for executing the Directorate's implementation responsibilities for the SAFETY (Support Anti-Terrorism by Fostering Effective Technologies) Act.

Office of Research and Development

We are fortunate to have Dr. Maureen McCarthy as our Director of Science and Technology's Office of Research and Development (ORD). Dr. McCarthy has served as Chief Scientist for the National Nuclear Security Administration and the Department of Energy (DOE) and was previously DOE's senior representative to the Homeland Security Transition Planning Office. She will lead the office as it strives to provide the Nation with an enduring capability in research, development, demonstration, testing and evaluation of technologies to protect the homeland. This office also plans to provide stewardship to the scientific community and to preserve and broaden the leadership of the United States in science and technology.

Activities within ORD address the resources that can be brought to bear to better secure the homeland through the participation of universities, national laboratories, federal laboratories and research centers. Directors have been appointed to lead efforts in each of these areas and staff is being added rapidly.

Homeland Security Advanced Research Projects Agency

Dr. David Bolka joined us in September 2003 as director of the Homeland Security Advanced Research Projects Agency, known as HSARPA. Dr. Bolka made significant contributions in advancing technical and scientific projects in his prior work with Lucent Technologies and Bell Laboratories, following a notable career in the United States Navy.

HSARPA is the external research-funding arm of the Science and Technology Directorate. It has at its disposal the full range of contracting vehicles and the authority under the Homeland Security Act to engage businesses, federally funded research and development centers, universities and other government partners in an effort to gather and develop viable concepts for advanced technologies to protect the homeland.

HSARPA's mission, as stated in the *Homeland Security Act of 2002,* is to support basic and applied homeland security research to promote revolutionary changes in technologies that would promote homeland security; advance the development, testing and evaluation, and deployment of homeland security technologies; and accelerate the prototyping and deployment of technologies that would address homeland security vulnerabilities. Its customers are state and local first responders, and federal agencies that are allied with homeland security such as the United States Coast Guard, United States Secret Service, the U.S. Citizenship and Immigration Services, the Federal Emergency Management Agency and others.

About 60 percent of the Science and Technology Directorate's appropriation in FY 2004 will be executed directly through the private sector with HSARPA managing about half of that. At least five to ten percent of HSARPA's funds are dedicated for revolutionary, long-range research for breakthrough technologies and systems.

Office of Systems Engineering and Development

Mr. John Kubricky joined us in early October 2003 as our Director of the Office of Systems Engineering and Development (SE&D). He is tasked with leading the implementation and transition of large-scale or pilot systems to the field through a rapid, efficient and disciplined approach to project management. Mr. Kubricky previously served as Advanced Program Development Manager for Northrop Grumman and has held senior positions with California Microwave and Westinghouse Defense.

One of the Science and Technology Directorate's challenges is to evaluate a wide spectrum of military and commercial technologies so rapid, effective and affordable solutions can be transitioned to the Department's customers that include first responders and federal agencies. In some cases, military technologies could be candidates for commercialization, but rigorous systems engineering processes need to be applied to ensure a successful transition. SE&D's role is to identify and then, in a disciplined manner, retire[TSPU1] risks associated with such technologies to ready them for deployment to the field. In doing so, the office must view each technology through the prism of affordability, performance and supportability—all critical to end-users.

SE&D must weigh considerations such as the urgency for a solution, consequences of the threat, safety of the product, and life cycle support as new products are introduced. Products must be user friendly, have a minimum of false alarms, require little or no training and consistently provide accurate results. SE&D will demonstrate and test solutions before they are released to the field, and will validate that those solutions meet user expectations.

Office of Weapons of Mass Destruction Operations and Incident Management

We created the Office of Weapons of Mass Destruction Operations and Incident Management to serve as the Science and Technology Directorate's technical support for crisis operations. The office provides scientific advice and support to the Office of the Secretary of Homeland Security in assessing and responding to threats against the homeland. This office's activities are primarily focused on the biological, chemical, radiological, and nuclear threats.

Portfolio Details

The Science and Technology Directorate has organized its efforts into 11 budget categories; these are further divided into portfolios that span the set of product lines of the Directorate.

Four portfolios address specific terrorist threats:

- Biological Countermeasures
- Chemical Countermeasures
- High Explosive Countermeasures
- Radiological and Nuclear Countermeasures.

Four portfolios crosscut these threats:

- Threat and Vulnerability, Testing and Assessment—this portfolio includes our support to the Information Analysis and Infrastructure Protection Directorate, including our critical infrastructure protection and cyber security activities.
- Standards
- Emerging Threats
- Rapid Prototyping

We also have portfolios that support the operational units of the Department (Border and Transportation Security; Emergency Preparedness and Response, United States Coast Guard and United States Secret Service) in both their homeland security and conventional missions.

Our University and Fellowship Programs portfolio addresses the need to build an enduring science and technology capability and support United States leadership in science and technology.

Our most recent portfolio, Counter-MANPADS, is seeking to improve technologies to protect commercial aircraft from the threat of MAN-Portable Air Defense Systems (MANPADS).

In addition, the Science and Technology Directorate is responsible for the management of one of the United States Government's E–Gov Initiatives, the SAFECOM Program. There are tens of thousands of state and local public safety agencies, and 100 federal law enforcement agencies that depend on inter-operable wireless communications. The SAFECOM (Wireless Public SAFEty Inter-operable COMmunications) program is the umbrella initiative to coordinate all federal, State, local, and tribal users to achieve national wireless communications inter-operability. The placement of SAFECOM in the Department of Homeland Security's Science and Technology Directorate allows it full access to the scientific expertise and resources needed to help our nation achieve true public safety wireless communications inter-operability.

At this time I would like to briefly describe some of our accomplishments to date and our FY 2005 plans. As can be seen in the following chart, we have an overall FY 2005 budget request of $1.0393 billion, which is an increase of $126.5 million (13.9 percent) over the FY 2004 levels. The request includes $35 million for construction of facilities. In addition, the increase includes President Bush's request for an additional $65 million dollars to enhance and expand the BioWatch Program.

BUDGET ACTIVITY	FY 2003 Amount (millions)	FY 2004 less rescission Amount (millions)	Proposed FY 2005 Amount (millions)	Increases/Decreases from FY 2004 to 2005 Amount (millions)	Increases/Decreases from FY 2004 to 2005 Percent Increase
Budget Activity M&A	**0.0**	**44.2**	**52.6**	**8.4**	**19.1%**
Salary and expenses	0.0	44.2	52.6	**8.4**	**19.1%**
Budget Activity R&D	**553.5**	**868.7**	**986.7**	**118.0**	**13.6%**
Bio Countermeasures (incl. NBACC)	362.6	285.0	407.0	**122.0**	**42.8%**
High-Explosives Countermeasures	0.0	9.5	9.7	**0.2**	**2.1%**
Chemical Countermeasures	7.0	52.0	53.0	**1.0**	**1.9%**
R/N Countermeasures	75.0	126.3	129.3	**3.0**	**2.4%**
TVTA (incl. CIP & Cyber)	36.1	100.1	101.9	**1.8**	**1.8%**
Standards	20.0	39.0	39.7	**0.7**	**1.9%**
Components	0.0	34.0	34.0	**0.0**	**0.0%**
University & Fellowship Programs	3.0	68.8	30.0	**-38.8**	**-56.4%**
Emerging Threats	16.8	21.0	21.0	**0.0**	**0.0%**
Rapid Prototyping	33.0	73.0	76.0	**3.0**	**4.1%**
Counter MANPADS	0.0	60.0	61.0	**1.0**	**1.7%**
R&D Consolidation transferred funds	0.0	0.0	24.1	**24.1**	
Total enacted appropriations and budget estimates	**553.5**	**912.8**	**1039.3**	**126.5**	**13.9%**

Biological Countermeasures

Biological threats can take many forms and be distributed in many ways. Aerosolized anthrax, smallpox, foot and mouth disease, and bulk food contamination are among the threats that can have high consequences for humans and agriculture. Our Biological Countermeasures portfolio uses the Nation's science base to prevent, protect, respond to and recover from bioterrorism events. This portfolio provides the science and technology needed to reduce the probability and potential consequences of a biological attack on this nation's civilian population, its infrastructure, and its agricultural system. Portfolio managers and scientists are developing and implementing an integrated systems approach with a wide range of activities, including vulnerability and risk analyses to identify the need for vaccines, therapeutics, and diagnostics; development and implementation of early detection and warning systems to characterize an attack and permit early prophylaxis and decontamination activities; and development of a national bioforensics analysis capability to support attribution of biological agent use.

In FY 2003 and 2004, the Biological Countermeasures portfolio:

- Deployed BioWatch to approximately 30 cities across the Nation. BioWatch consists of air samplers that detect the release of biothreat pathogens, such as anthrax, in a manner timely enough to allow for effective treatment of the exposed population. In addition, with additional funds provided by Congress in FY 2004, we were able to integrate environmental monitoring data with biosurveillance to provide early attack alerts and assessments. The environmental monitoring activities include not only BioWatch, which provides continuous monitoring of most of our major metropolitan areas, but also targeted monitoring that is temporarily deployed for special national needs, such as a Homeland Security Elevated Threat Level. While serving the primary function of mitigating attacks, both BioWatch and environmental monitoring systems also play a significant deterrent role, since terrorists are less likely to attack when they know that defensive systems prevent them from attaining their goals.
- Established the National Biodefense Analysis and Countermeasures Center, which provides scientific support for intelligence activities, prioritizes biothreats, and conducts bioforensic analyses for attribution and hence deterrence.

In FY 2005, we will build upon our past work and continue to deploy and improve wide area monitoring systems for urban areas. Under President Bush's new Biosurveillance Initiative, which accounts for most of the FY 2005 increase in funding, additional capability will be implemented quickly in the top threat urban areas—more than twice the current capability. We will be working on decontamination technologies and standards for facilities and outdoor areas, and a National Academy of Sciences study characterizing contamination risks will be completed in FY 2005. At a smaller scale, we will define requirements for expanded technology in detect-to-warn scenarios relevant to facilities monitoring. At the same time, we will be building our capabilities in the National Biodefense Analysis and Counterterrorism Center (NBACC) and at Plum Island Animal Disease Center (PIADC). At the NBACC, we are focusing first on bioforensics and development of a biodefense knowledge center; for agro-bioterrorism, we are prioritizing countermeasures to foreign animal diseases. We are requesting additional funding in FY 2005 for Plum Island to improve the facilities and security of this important research and development site.

Chemical Countermeasures

The National Research Council Report, *Making the Nation Safer,* points out that "chemicals continue to be the weapon of choice for terrorist attacks." The large volumes of toxic industrial chemical and materials along with the potential for chemical warfare agents and emerging threat agents constitute a broad range of threats that may be applied to virtually any civilian target.

Our Chemical Countermeasures portfolio provides the science and technology needed to reduce the probability and potential consequences of a chemical attack on this nation's civilian population. The portfolio places high priority on characterizing and reducing the vulnerability posed by the large volumes of toxic industrial materials in use, storage or transport within the Nation. The research and development activities include prioritization of efforts among the many possible chemical threats and targets, and development of new detection and forensic technologies and integrated protective systems for high-value facilities such as airports and subways. These activities are informed by end-user input and simulated exercises.

Over the past year, our Chemical portfolio completed Project PROTECT—Program for Response Options and Technology Enhancements for Chemical/Biological Terrorism—a program conducted in collaboration with the Washington Metropolitan Area Transit Authority (WMATA). PROTECT, an operational chemical agent detection and response capability, significantly decreases response time, which in the event of an attack will save human lives. PROTECT is deployed in 13 Metro stations and is operated by the WMATA.

In FY 2005, our focus will be on protecting facilities from chemical attacks and controlling the industrial chemicals that may be used for such attacks. Our scientists, working with the Information Analysis and Infrastructure Protection Directorate (IAIP), will complete a detailed end-to-end study of three reference scenarios, to culminate in recommendations for top-level architectures, identification of key gaps, and a "report card" showing present, mid-term (three-year), and long-term (five-plus year) capabilities. We will qualify candidate off-the-shelf sensors for demonstration in an application to facilities protection. We will address response and recovery, too. Working with the user community, we will develop first-generation playbooks for responding to the three reference scenarios and develop technical requirements for personal protection equipment.

High Explosives Countermeasures

The High Explosives Countermeasures portfolio addresses the threat that terrorists will use explosives in attacks on buildings, critical infrastructure, and the civilian population of the United States. The Science and Technology Directorate's portfolio is closely coordinated with the activities ongoing in the Transportation Security Administration to ensure that R&D activities are complementary, not duplicative. R&D priorities in this portfolio have focused on the detection of vehicle bombs and suicide bombers, and on providing the science and technology needed to significantly increase the probability of preventing an explosives attack on buildings, infrastructure and people.

This portfolio in FY 2005 will develop and field equipment, technologies and procedures to interdict suicide bombers and car and truck bombs before they can reach their intended targets while minimizing the impact on the American way of life. We will complete testing and evaluation of known procedures and commercial off-the-shelf devices applicable to indoor or outdoor interdiction of suicide bombers, and develop a training package for local law enforcement, including recommended equipment and procedures. In addition, we will support the development of new devices

to interdict suicide bombers and study the feasibility of using existing detectors to identify explosives in trucks. Finally, we will analyze the costs and benefits of hardening aircraft cargo containers, cargo bays, and overhead bin storage compartments to better withstand the effects of an explosion.

Radiological and Nuclear Countermeasures

Potential radiological and nuclear threats range from the deliberate dispersal of small amounts of radioactive material to the detonation of an improvised or stolen nuclear weapon to an attack on our nuclear power industry. Our Radiological and Nuclear Countermeasures portfolio provides the science and technology needed to reduce both the probability and the potential consequences of a radiological or nuclear attack on this nation's civilian population or our nuclear power facilities.

In FY 2003, our Radiological and Nuclear Countermeasures portfolio formally assumed (on August 19, 2003) management of the Port Authority of New York and New Jersey radiation detection testbed. The test bed was previously managed by the United States Department of Energy. Following the transfer, we have broadened the project scope beyond just testing and evaluating individual pieces of technology to a systems approach, including response protocols and operational concepts. As part of the Science and Technology Directorate's effort, radiation detection sensors will be deployed and operated by federal, State, and local inspectors and police at land, maritime and aviation venues. By judging the efficacy of deployed systems over time, we will be able to inform future decisions on detection technology R&D investment, deployment of urban monitoring systems, configurations best able to enhance security, and viable ways to defend against a radioactive dispersal device or an improvised nuclear device.

For FY 2005, we plan to leverage our previous technology and capability successes and place a high priority on providing the end-user community with the most appropriate and effective detection and interdiction technologies available to prohibit the importation or transportation and subsequent detonation of a radiological or nuclear device within U.S. borders. Specifically, we will do the following:

- Integrate at least five federal, State, and local sites into an operational detection system architecture to detect radiological and nuclear threats;
- Establish a test and evaluation capability, and test and evaluate 90 percent of the FY 2005 prototype technologies developed in the portfolio's programs;
- Demonstrate two advanced characterization technologies for crisis response;
- Demonstrate a prototype for automatic radiological imaging analysis that enhances current imaging systems at one pilot site.

Threat and Vulnerability, Testing and Assessment

Our Threat and Vulnerability, Testing and Assessment (TVTA) portfolio is one of our largest portfolios, and includes our scientific and technical support to the Information Analysis and Infrastructure Protection (IAIP) Directorate. TVTA includes our R&D activities in Critical Infrastructure Protection and Cyber Security. Activities in this portfolio are designed to help evaluate extensive amounts of diverse threat information; detect and document terrorist intent; couple threat information with knowledge of complex, interdependent critical infrastructure vulnerabilities; and enable analysts to draw timely insights and distribute warnings from the information. This portfolio provides the science and technology needed to develop methods and tools to test and assess threats and vulnerabilities to protect critical infrastructure and enhance information exchange; this portfolio also includes a Biometrics Program and a Cyber Security Program.

In FY 2004, TVTA:

- Developed and installed an operational component, the Threat-Vulnerability Mapper (TVM), as part of the Threat and Vulnerability Integration System for the Information Analysis and Infrastructure Protection Directorate. The TVM provides counterterrorism analysts with a simple, straightforward way not only to depict the geographic distribution of threats across the United States, but also to search the underlying databases for information on the possible actors, agents, potential severity of attacks, and extent of the vulnerabilities to and effects of such attacks.
- Co-funded the Cyber Defense Technology Experimental Research ("DETER") Network with the National Science Foundation, a $5.45 million, three-year research project to create an experimental infrastructure network to support development and demonstration of next-generation information security technologies for cyber defense. This is a multi-university project led by the University of California at Berkeley.

- Developed a Decision Support System focused on prioritizing investment, protection, mitigation, response, and recovery strategies related to Critical Infrastructure Protection. The initial proof-of-concept began in August 2003 and a case study is being conducted in February 2004. The prototype model will include representation of all 14 critical infrastructure sectors/assets and their interdependencies.
- Developed advanced algorithms for speeding the creation of DNA signatures for biological pathogen detection through the Advanced Scientific Computing Research and Development program. These discoveries will result in cheaper, faster and more reliable bio-detectors for homeland security.

In FY 2005, TVTA will provide the science and technology capabilities and enduring partnerships needed to develop methods and tools to test and assess threats and vulnerabilities to protect critical infrastructure and enhance information exchange. The Threat-Vulnerability Mapper is only one component of a large Threat and Vulnerability Information System that we will continue to build, drawing upon advances in the information and computer sciences as well as innovative analytic techniques. Our objective is to continually improve an analyst's capability to answer threat-related questions. The Science and Technology Directorate will contribute to the capability to produce high-quality net assessments and assessments of weapons of mass destruction. We will develop advanced computing algorithms in support of improved aerosol dispersion models, blast effects calculations, neutron interrogation models, bioinformatics, and scalable information extraction; improved algorithms make more accurate information available faster. We will continue to provide, in collaboration with other relevant organizations, the science and technology and associated standards needed in the development of biometrics for precise identification of individuals and develop instrumentation to aid authorized officials in detecting individuals with potentially hostile intent. In the cyber security area, the DETER Network testbed will be up and running, and we will competitively fund several low-cost, high-impact solutions to specific cyber security problems.

Standards

Ensuring that standards are created and adopted is critically important for homeland security. We need consistent and verifiable measures of effectiveness in terms of basic functionality, appropriateness and adequacy for the task, inter-operability, efficiency, and sustainability. Standards will improve the quality and usefulness of homeland security systems and technologies. Our Standards portfolio cuts across all aspects of the Science and Technology Directorate's mission and all threats to improve effectiveness, efficiency, and inter-operability of the systems and technologies developed, as envisioned in the Homeland Security Act.

Our Standards portfolio continues to actively engage the federal, State, and local first responders to ensure that developed standards are effective in detection, prevention, response, management, and attribution. This portfolio also conducts the essential activities in order to meet the requirement of the SAFETY (Support Anti-Terrorism by Fostering Effective Technologies) Act in developing certification standards for technologies related to homeland security.

In FY 2004, our Standards portfolio:

- Created initial standards guidelines, with formal standards nearing completion, for radiation pagers, hand-held radiation dosimetry instruments, radioisotope identifiers and radiation portal monitors. These standards were developed under the auspices of the American National Standards Institute's Accredited American Standards Committee on Radiation Instrumentation.
- Published guidelines for inter-operable communications gear. Common grant guidance has been developed and incorporated in the public safety wireless inter-operability grant programs of both the Justice Department and the Department of Homeland Security;
- Launched the SAFETY Act process for evaluating anti-terrorism technologies for potential liability limits.

In FY 2005, the Standards portfolio will continue to work on many fronts and with many partners to establish needed standards for technologies (including equipment), processes, and systems. We will especially focus on two major milestones. First, we will establish technical standards and test and evaluation protocols for decontamination technologies and analysis across the ranges of weapons of mass destruction. Second, we will publish a "Consumer's Report" on radiation and bio-agent detection devices for federal, State, and local users.

Emerging Threats

It is truly the threats we do not yet know that are often the most terrifying. Our Emerging Threats portfolio addresses the dynamic nature of terrorist threats, as science and technology advancements enable new agents of harm and new ways to employ them. This portfolio places high priority on developing the capability to use innovative, crosscutting, out-of-the-box approaches for anticipating and responding to new and emerging threats. Successful identification of emerging threats will permit capabilities to be developed to thwart these emerging threats before they are used.

Relevant R&D is underway at other agencies and organizations; thus, partnerships in this area hold great potential for synergistic focus on homeland security. Work is being done and will continue to be pursued in partnership with the Departments of Energy, Defense, Justice, and Agriculture, the intelligence community, and the National Institutes of Health.

In FY 2003 and 2004, our scientists in the Emerging Threats portfolio established informal partnerships with the intelligence community and with the United States Secret Service in order to leverage ongoing activities in support of over-the-horizon assessment.

In FY 2005, we will leverage the activities started during FY 2004, and continue to focus on developing the capability to use innovative, crosscutting, out-of-the-box approaches for anticipating and responding to new and emerging threats and to develop revolutionary technologies to combat them.

Rapid Prototyping

By accelerating the time needed to develop and commercialize relevant technologies, the Science and Technology Directorate will ensure that operational end-users will be better able to prevent terrorist attacks, reduce the Nation's vulnerability, and minimize the damage and assist in recovery if attacks occur. Our Rapid Prototyping portfolio advances the Directorate's mission to conduct, stimulate and enable research, development, test, evaluation and timely transition of homeland security capabilities to federal, State and local operational end-users.

In FY 2003 and FY 2004, the Rapid Prototyping portfolio provided funding of $30 million each year through HSARPA to the interagency Technical Support Working Group (TSWG) to solicit ideas, concepts and technologies for 50 requirement areas of interest to both the Department and TWSG; initial contracts have been made and HSARPA will provide the programmatic monitoring of those efforts for the Science and Technology Directorate. This portfolio also provided support through HSARPA for a joint port and coastal surveillance prototype testbed with the United States Coast Guard, designated "HAWKEYE." Funding has been made available to support the creation of a Technology Clearinghouse as required in the *Homeland Security Act of 2002.*

In FY 2005, this program will continue to provide a mechanism for accelerated development of technologies relevant to homeland security in a process driven by technology developers. Through rapid prototyping and commercialization, these technologies will be made available to operational end-users as quickly as possible, thus increasing their capability to secure the homeland.

Support to Department of Homeland Security Components

As I have mentioned, the operational components of the Department are my customers. The Department of Homeland Security's Science and Technology Directorate supports the missions of the Information Analysis and Infrastructure Protection (IAIP) Directorate, Border and Transportation Security (BTS), Emergency Preparedness and Response (EP&R), United States Coast Guard (USCG), and United States Secret Service (USSS). Our TVTA portfolio supports the mission of the IAIP Directorate as previously indicated. This portfolio places high priorities on high-risk, high-reward research and development relevant to homeland security that might not otherwise be conducted in support of the missions of BTS, EP&R, USCG, and the USSS.

In FY 2003 and FY 2004, we continued to support the conventional missions of these operational components. Ongoing activities within BTS, USCG and USSS focus on preventing terrorists and terrorist weapons (particularly weapons of mass destruction) from entering the United States, on detecting and preventing cyber attacks, supporting maritime transportation, safety and economy (Port and Channel navigation, Search and Rescue, and Aquatic Nuisance Species Remediation), and on preventing attacks on United States Secret Service protectees and high-visibility venues.

Support to Border and Transportation Security

The Science and Technology Directorate supports all elements of BTS enforcement and facilitation processes through identifying operational requirements, developing mission capabilities-based technological needs and implementing a strategic plan. We are providing systems engineering support to various BTS programs including US VISIT and Unmanned Aerial Vehicles.

The Science and Technology Directorate's support to the BTS Directorate is accomplished by implementing a capabilities-based technology planning process. The capabilities-based approach establishes the scope of effort and framework for a technology plan. Through a series of user conferences and technology opportunity conferences, requirements are developed and prioritized for new and improved capabilities. Operational personnel identify capabilities and technology personnel identify potential development opportunities. Capability gaps and possible technology solutions are proposed, and a budget is developed to distinguish between both funded and unfunded needs.

The Science & Technology Directorate co-chairs with BTS, the Department's Unmanned Aerial Vehicle (UAV) Working Group, which is currently focused on developing the Border and Transportation Security operational requirements for UAVs and related technologies, e.g., aerostats, blimps, lighter than air (LTA) ships, and fixed and mobile towers. The starting point for the requirements generation process is six BTS capability objectives we have identified that could benefit by the utilization of UAVs: surveillance and monitoring communications, apprehension, targeting, intelligence, deterrence, and officer safety. Functional capabilities that could be filled or improved through the application of UAVs and other technologies have been identified. Based on these high-level requirements, the Science and Technology Directorate is developing concepts of operations and assumptions that will be used in conducting an Analysis of Alternatives that will include UAVs and other technologies.

In FY 2005 we will be involved in a wide range of activities supporting the components, based upon their needs. For BTS, we will focus on discovering and implementing technologies that include improved screening and inspection, access control, document verification and validity, and data compression and analysis.

Support to Emergency Preparedness and Response

The Nation has more than 750 regionally accredited community colleges. Community colleges train more than 80 percent of our country's first responders; these first responders are critical for homeland security. The Science and Technology Directorate has a responsibility to ensure that these first responders have the necessary tools available to them to perform their jobs effectively and safely on a daily basis. This portfolio has a key role in our meeting that responsibility.

The scope of our EP&R portfolio includes research, development, test and evaluation for State, local and federal emergency responders and emergency managers. Particular emphasis is placed on technology integration at all levels of government, technology insertion for weapons of mass destruction detection and monitoring systems, and long-term sustained performance and inter-operability to enhance State and local preparedness.

Our work in the EP&R portfolio focuses on three major areas:

- Technology development for first responders
- Scientific and technical support to federal response
- Technology integration—Safe Cities

The Safe Cities Program, a new initiative in FY 2004, is focused on implementing technology and operational system solutions in local communities/regions. This program is being piloted in a select number of cities in FY 2004 and will be conducted in close cooperation with State and local emergency managers and city planners to identify capability needs and gaps that advanced technologies being developed by the Science and Technology Directorate can meet. The Safe Cities Program seeks to provide technology and operational solutions that are sustainable by the communities in which they are implemented. The Safe Cities Program will enable us to better understand the operational context into which new technologies will be inserted. The Program will result in the creation of an infrastructure that facilitates the evaluation of new technologies in real-world operating environments as well as providing a venue for integrating these technologies with existing state and local systems.

In FY 2005 the EP&R portfolio will continue its focus on technology development and technical guidance for first responders (State and local), scientific and technical

support to the EP&R Directorate; and expansion of technology integration—Safe Cities.

Support to United States Coast Guard

The Science & Technology Directorate is integrating a major research program into a United States Coast Guard operational testbed in south Florida. The HAWK-EYE program injects technologies (such as Surveillance, Command & Control, Sensor Fusion, and Communications) allowing simultaneous evaluation of technology performance as a direct impact on mission execution. Additionally, funding has been made available to support many conventional mission research including improvements to Search and Rescue, Remediation of Aquatic Nuisance Species, and Spill Response.

Support to the United States Secret Service

We have coordinated with the United States Secret Service and established its first direct-funded R&D program. Based upon appropriated funding, four initiatives have been identified and prioritized, and are underway in FY 2004. In addition, there will be joint activities in support of the assessment of emerging threats.

Homeland Security University and Fellowship Programs

In this portfolio we seek to develop a broad research capability within the Nation's universities to address scientific and technological issues related to homeland security. The portfolio places high priorities on developing academic programs and supporting students in order to build learning and research environments in key areas of Departmental interest.

In FY 2004, this portfolio established the Department of Homeland Security's first University-based Center of Excellence, for Risk and Economic Analysis of Terrorism events. The Center, based at the University of Southern California, The Center, based at the University of Southern California, will assess the level of risk associated with various terrorist scenarios, in particular the potential economic consequences. A request for proposals has been issued for the next two Centers of Excellence, which will focus on Foreign Animal and Zoonotic Disease Defense and Post-Harvest Food Protection and Defense.

Last fall, we awarded our 2003–2004 academic year DHS Scholarships and Fellowships, and welcomed our new Scholars and Fellows with a reception in Washington, DC. The solicitation for this program received just under 2,400 applications for 100 scholarships and fellowships. Besides making immediate contributions to homeland security-related R&D, these students will be part of the development of a broad research capability within the Nation's universities to address scientific and technological issues related to homeland security.

During FY 2005, another 100 Scholars and Fellows will be supported for the academic year of 2004–2005, bringing the total of supported students to 200. We will also continue to support the Homeland Security University Centers of Excellence established in FY 2004, each with a different subject expertise focused on reducing the terrorist threat on the United States. Each Center of Excellence is awarded an initial three-year contract whose annual cost we account for in our planning.

Because our university programs are focused on conducting the foundational research needed for current and future requirements, now is also a good time to briefly discuss the amount of basic research, applied research, and development we are currently conducting and our plans for the future. In the 11 months that this Department has been in existence, the Science and Technology Directorate has focused its initial efforts on near-term development and deployment of technologies to improve our nation's ability to detect and respond to potential terrorist acts. However, we recognize that a sustained effort to continually add to our knowledge base and our resource base is necessary for future developments. Thus, we have invested a portion of our resources, including our university programs, toward these objectives. The following table indicates our expenditures in basic research, applied research, and development to date, excluding construction funding.

Science and Technology Directorate R&D Investments (in millions of $)			
Fiscal Year	**FY 2003(actual)**	**FY 2004(estimated)**	**FY 2005(proposed)**
Basic	47	117	80
Applied	59	56	229
Developmental	398	608	643
Total	**504**	**781**	**952**
% basic	**9.3%**	**15.0%**	**8.4%**

Our initial expenditures in basic research are heavily weighted by our investments in university programs. These university programs will not only provide new information relevant to homeland security, but will also provide a workforce of people who are cognizant of the needs of homeland security, especially in areas of risk analysis, animal-related agro-terrorism, bioforensics, cyber security, disaster modeling, and psychological and behavioral analysis.

We expect to gradually increase our total percentage of basic and applied research to the level needed for sustaining our role as an RDT&E organization.

Counter-MANPADS

The Counter-MANPADS program is focused on identifying, developing, and testing a cost-effective capability to protect the Nation's commercial aircraft against the threat of man-portable, anti-aircraft missiles. This program also provides the science and technology base needed to reduce the vulnerability of commercial aircraft to terrorist attack using man-portable anti-aircraft missiles.

Over the past year, we have had a successful solicitation announcing a program to address the potential threat of MANPADS to commercial aircraft. White papers responding to the Counter-MANPADS program solicitation were reviewed by technical experts from the Department of Homeland Security, Department of Defense, and other government agencies; proposals were evaluated; and awards were made to three contractor teams to perform the first of two program phases, which began in January, 2004. The first phase will result in a preliminary design and a test plan to demonstrate missile countermeasure equipment on selected commercial aircraft.

The second program phase is an 18-month effort beginning in August 2004, with the one or two contractors that produced the most promising results in Phase One. During this phase, the commercial prototype countermeasure equipment will be integrated on selected commercial aircraft, and live-fire range tests will be accomplished with extensive data collection and analysis. Results of this second phase will be presented to the Administration and Congress to aid in formulating an informed decision on how best to address the protection of commercial airlines from the MANPADS threat.

SAFECOM

The SAFECOM (Wireless Public SAFEty Inter-operable COMmunications) program is the umbrella initiative to coordinate all federal, State, local, and tribal users to achieve national wireless communications inter-operability. The placement of SAFECOM in the Department of Homeland Security's Science and Technology Directorate allows it full access to the scientific expertise and resources needed to help our nation achieve true public safety wireless communications inter-operability. Since the Science and Technology Directorate formally assumed responsibility for the management of the SAFECOM program barely seven months ago:

- SAFECOM has been established as the one umbrella group in the Federal Government for the management of public safety wireless inter-operability programs.
- Common grant guidance has been developed and incorporated in the public safety wireless inter-operability grant programs of both the Justice Department and the Department of Homeland Security.
- A federal coordinating structure has, for the first time, been created to coordinate all federal public safety wireless inter-operability programs.

- The first catalog of national programs touching on public safety wireless inter-operability has been developed and published.
- The ten major state and local organizations concerned with public safety wireless inter-operability—the Association of Public-Safety Communications Officials (APCO), International Association of Fire Chiefs (IAFC), International Association of Chiefs of Police (IACP), Major Cities Chiefs Association (MCC), National Sheriffs' Association (NSA), Major County Sheriffs' Association (MCSA), National Association of Counties (NACO), National League of Cities (NLC), National Public Safety Telecommunications Council (NPSTC), and the United States Conference of Mayors (USCM)—released a statement in support of the SAFECOM program which declared that "With the advent of the SAFECOM Program. . .Public safety, State and local government finally have both a voice in public safety discussions at the federal level and confidence that the Federal Government is coordinating its resources."

Engaging Private Industry

On May 14, 2003, the Science and Technology Directorate, and the interagency Technical Support Working Group issued a joint Broad Agency Announcement soliciting ideas, concepts, and technology for 50 requirements areas of mutual interest. This solicitation received 3,344 submittals by the closing date of June 13, 2003. These initial submittals and the subsequent white papers and proposals used a comprehensive criteria-based evaluation to determine awards, of which more than 50 are expected when the process is completed. HSARPA will provide the programmatic monitoring for the Science and Technology Directorate for these awards.

In addition to its work with TSWG, HSARPA has engaged the private sector in its first solicitation, seeking detection systems for chemical and biological weapons and associated materials. We are interested in a timeline of nine to 36 months for taking a technology from concept to prototype. Interest and response from the private sector has been exceedingly strong. We held a bidders' conference in Washington, D.C., on September 29, 2003, that drew approximately 400 participants; and we have received more than 500 white papers as a result. Finalists have been selected for negotiation, and work has already begun in a number of the more important areas.

HSARPA issued its second major solicitation to address radiological and nuclear detection and portal monitoring systems. This and other solicitations will seek to engage our nation's research and development community, including academia, federally funded research and development centers, non-profit organizations, and industry.

On November 13, 2003, HSARPA issued a Small Business Innovation Research Program Solicitation. The purpose of this solicitation was to invite small businesses to submit innovative research proposals that address eight high-priority DHS requirements:

- New systems/technologies to detect low vapor pressure chemicals (e.g., toxic industrial chemicals)
- Chemical and biological sensors employing novel receptor scaffolds
- Advanced low-cost aerosol collectors for surveillance sensors and personnel monitoring
- Computer modeling tool for vulnerability assessment of U.S. infrastructure
- Ship compartment inspection device
- Marine Asset Tag Tracking System
- Automatic Identification System tracking and collision avoidance equipment for small boats
- Advanced Secure Supervisory Control and Data Acquisition (SCADA) and related distributed control systems.

By the December 15, 2003, deadline 374 proposals had been received. Evaluation of these proposals is complete and 66 proposers have been notified that they will enter negotiations for Phase I contracts beginning February 9, 2004.

We are very pleased with the response and interest that private industry has shown in helping strengthen homeland security and want to publicly acknowledge their contributions.

Other Science and Technology Activities

In addition to the portfolios and programs previously described, we also have addressed the legislative requirement to establish a Homeland Security Institute and a Homeland Security Science and Technology Advisory Committee, both of which

will serve to provide independent input and assessment to the Department and the Science and Technology Directorate.

A formal solicitation was issued in December 2003 for the Homeland Security Institute, a legislative requirement for a federally funded research and development center to assist the Secretary and the Department in addressing important homeland security issues that require scientific, technical, and analytical expertise. Proposals were received in January 2004. Those proposals are currently being evaluated with an expected five-year award by early May 2004.

In addition, we have now established the Homeland Security Science and Technology Advisory Committee, a legislative requirement for an advisory committee to be a source of independent, scientific and technical planning advice for the Under Secretary for Science and Technology. The committee will hold its initial meeting in February 2004.

Staffing

When the Department of Homeland Security stood up on March 1, 2003, the Science and Technology Directorate had a total staff of about 87, including the 53 staff transferred from the Department of Energy's Environmental Measurements Laboratory. The balance was comprised of permanently assigned personnel, employees detailed from within and without the Department, Intergovernmental Personnel Act assignments, and personnel support from the National Laboratories.

By January 6, 2004, we more than doubled our staff. In January 2004, we had a total staff of 212, including 100 DHS employees, six Public Health Service Officers, 21 Intergovernmental Personnel Act employees, 26 individuals on assignment from other agencies, and 59 contractors.

We continue to be active in staffing our Directorate with well-qualified individuals whose skills support the full breadth of our responsibilities and RDT&E activities. We continue to actively seek additional staff in accordance with our approved staffing plan.

Interagency Coordination

One of the accomplishments of which I am personally most proud is the emphasis our new Directorate has put on interacting with other federal departments and agencies. Knowledge of other science and technology programs and their results, appropriate collaboration between agencies, coordination of relevant programmatic activities, and information sharing are essential for us to best meet our mission requirements. With pride, I point to interactions between our cyber security personnel and those at the National Science Foundation and the National Institute of Standards and Technology, who dialog frequently and have already established collaborative and coordinated programs to ensure no duplication of effort. Our biological and chemical countermeasures staff have partnered with DOD's Defense Threat Reduction Agency (DTRA) to plan and execute the BioNet program and roadmap the biological countermeasures R&D programs in both agencies to understand capabilities and shortfalls. They work with the National Science Foundation on pathogen sequencing. The BioWatch program, although led by the Science and Technology Directorate, was accomplished through collaboration with personnel from the Department of Energy's National Laboratories, contractors, the Environmental Protection Agency, and the Centers for Disease Control and Prevention. We work with DOD's Office of Homeland Defense to ensure the effective transfer to the Department of relevant DOD technologies.

Our high explosives scientists are working with the interagency Technical Support Working Group, managed by the Department of State, to evaluate commercial off-the-shelf systems with capabilities against suicide bombers. The Director of the Homeland Security Advanced Research Projects Agency is a member of the TSWG Executive Committee. Our staff are in frequent contact with the Office of Science and Technology Policy on a range of issues, and several are members and co-chairs of the Office of Science and Technology Policy's National Science and Technology Council. Our Office of Research and Development works closely with the Department of Agriculture to ensure that the Plum Island Animal Disease Center facility is operating smoothly and fully meeting its mission. The Office of Research and Development also interfaces with the Department of Energy to keep the Office of Science, as well as the National Nuclear Security Administration, apprised of our long-term homeland security requirements.

Conclusion

With less than a full year under the Department's belt, the scientists and engineers in the Science and Technology Directorate have accomplished more than I could have expected. I am proud to have shared with you today some of those suc-

cess stories. We have appended a more comprehensive summary of accomplishments to date for the record.

And yet, we also recognize that there is much to do, and we will be working just as hard in FY 2005.

I look forward to continuing to work with you on the Science Committee, my colleagues here today, other federal departments and agencies, the academic community and private industry to continue the work begun and continually improve our ability to protect our homeland and way of life.

Mr. Chairman, Congressman Gordon and Members of the Committee, this concludes my prepared statement. I thank you for the opportunity to appear before this committee and will be happy to answer any questions you may have.

Appendix

ACCOMPLISHMENTS OF THE SCIENCE AND TECHNOLOGY DIRECTORATE
DEPARTMENT OF HOMELAND SECURITY
MARCH 2003 TO FEBRUARY 2004

Biological and Chemical Countermeasures

Biowatch: National Urban Monitoring for Biological Pathogens

The Biowatch program has been established and deployed to cities across the Nation. The program—developed, funded, and managed by the Science and Technology (S&T) Directorate—is executed in cooperation with the Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC). It employs environmental sampling devices to quickly detect biological pathogens, such as anthrax, in time to distribute life-saving pharmaceuticals to affected citizens. The S&T Directorate is now focusing its efforts on piloting the next generation of environmental samplers, which will reduce the amount of labor required and the response time needed for detection while keeping the detection probability high and false alarm rates low. These devices will take advantage of the latest advances in micro-chemistry, commonly referred to as "chemistry on a chip."

PROTECT (Program for Response Options and Technology Enhancements for Chemical Terrorism): Chemical Defense and Response Capability for Transportation Facility

The S&T Directorate, in collaboration with the Washington Metropolitan Area Transit Authority (WMATA), completed PROTECT (Program for Response Options and Technology Enhancements for Chemical/Biological Terrorism). PROTECT, which is an operational chemical agent detection and response capability, is deployed in 13 stations and operated by the WMATA. PROTECT is a team effort that owes its success to the scientific and engineering talent from Argonne, Sandia, and Livermore National Laboratories and operational expertise from WMATA and the First Responder community (the District of Columbia; Arlington, VA; Montgomery County, MD; and others). Also contributing significantly to the project are private industry partners, including LiveWave Inc., ManTech Security Technology, the detector manufacturer (name withheld for security reasons); and federal partners, including the Federal Transit Administration (FTA), Department of Transportation (DOT), National Institute of Justice (NIJ), and the Department of Homeland Security's (DHS's) Office of Domestic Preparedness (ODP). The system integrates chemical detector data and video feed and transmits the integrated information to the Operation Control Center (OCC), where the information is analyzed and an event confirmed. The information is then transmitted to the first responders who access it in both their OCC and through the use of wired jacks on the scene to facilitate response and recovery. PROTECT also has application in other areas, including fire and emergency response, security, and forensics. Upon completion, the system will be totally owned and operated by WMATA and expanded to approximately 20 stations. FTA is working with WMATA and Argonne National Laboratory to transfer the technology nationally. The information gleaned from PROTECT will have direct application to facility protection and response. A related effort is being piloted in the Boston subway system.

Joint Urban 2003: Experimental Atmospheric Transport and Modeling

In June 2003, the S&T Directorate, in coordination with the Department of Defense's Defense Threat Reduction Agency, Department of Energy, and University of Oklahoma sponsored a month-long atmospheric dispersion study in Oklahoma City, OK. Nearly 150 scientists, engineers, and student assistants were dedicated to this study, which tracked the air movement of safe, non-toxic tracer gases in and around city buildings. The resulting data is being used to enhance and develop urban-specific atmospheric dispersion computer models that will allow emergency management, law enforcement and other personnel to train for and respond to potential chemical, biological, and radiological terrorist attacks.

ProACT (Protective and Response Options for Airport Counter Terrorism): Chemical and Biological Counterterrorism Demonstration and Application Program

The S&T Directorate and its partners at the San Francisco International Airport are involved in a pilot program that couples biological and chemical detection with vulnerability analysis, response, and restoration. This program integrates networked sensors with the operation of ventilation systems, allowing redirection of contaminated air and effective evacuation should an event occur. Guidance for the

airport facility operators to manage biological and chemical crises will be finalized soon for distribution throughout the applicable community. Protocols and concepts of operation for restoration also are under development. This program is designed to serve as a template for deployment of these capabilities to other similar facilities.

LINC (Local Integration of National Atmospheric Release Advisory Center [NARAC] with Cities): Hazard Assessment Tool for Operational Event Management

LINC demonstrates the capability for providing local government agencies with advanced operational atmospheric plume prediction capabilities that can be seamlessly integrated with appropriate federal agency support for homeland security. LINC's approach is to integrate NARAC capabilities with local emergency management and response centers. In the event of a chemical or biological release, NARAC predictions can be used by emergency managers and responders to map the extent and effects of hazardous airborne material. Prompt predictions are provided to guide front-line responders in determining protective actions to be taken, critical facilities that may be at risk, and safe locations for incident command posts. LINC provides response teams from multiple jurisdictions with tools to effectively share information regarding the areas and populations at risk. To date, several cities have participated in the project. New York City used LINC to help inform and manage an explosion and fire at a Staten Island refinery in the Spring of 2003.

BioNet: Integrated Civilian and Military Consequence Management

The Department of Homeland Security (DHS) and the Department of Defense's Defense Threat Reduction Agency have initiated the BioNet program to address joint civilian-military consequence management issues for localities near military bases. Upon completion of BioNet, a seamless consequence management plan that incorporates concepts of operation, information products, area monitoring, population health monitoring, and sample analysis laboratory will be developed that can be used nationally.

Plum Island Animal Disease Center (PIADC)

The S&T Directorate assumed responsibility for the operations of the "facilities and liabilities" of PIADC in June 2003. A 60-day review of security and operations resulted in immediate improvements and a plan for enhancements to security and operational maintenance. Dr. Beth Lautner has become new Center Director for PIADC. Dr. Lautner was with the National Pork Board for 13 years, most recently serving as the vice-president of Science and Technology. Highly respected throughout animal agriculture for her work on numerous issues, she pioneered the establishment of the Pork Quality Assurance (PQA) Program and has worked extensively with the USDA and other organizations on national agricultural security issues. In 1994, she was awarded the prestigious Howard Dunne Memorial Award by the association. In addition, DHS announced on December 9, 2003, the selection of Field Support Services, Inc. (FSSI), as the new contractor for maintenance at PIADC. FSSI is a subsidiary of Arctic Slope Regional Corporation, an Alaskan Native corporation, headquartered in Barrow, Alaska.

TOPOFF2 Exercise

In May 2003, leadership and staff members of the Science and Technology Directorate served as members of the Secretary's Crisis Assessment Team (CAT) and the interagency Domestic Emergency Support Team (DEST) and provided expert technical advice on understanding, communicating and responding to the hypothetical radiological and plague events during the TOPOFF2 exercise.

Radiological and Nuclear Countermeasures Programs

Radiation Detection in Metropolitan Areas

The Science and Technology division formally assumed management of the Port Authority of New York and New Jersey's radiation detection test bed on August 2003. The test bed was previously managed by the U.S. Department of Energy. The transfer will broaden the project scope beyond testing and evaluation of individual pieces of technology to a systems approach including response protocols and operational concepts. Radiation detection equipment will be installed at tunnels, bridges, ports, and airports in the New York City metropolitan area, and all functions associated with their operational use will be evaluated. By judging the efficacy of fielded systems over time, the Science and Technology division will be able to influence future decisions on detection technology R&D investment, deployment of urban monitoring systems, configurations best able to enhance security, and viable solutions for protecting the Nation from radiological and nuclear threats.

Determined Promise Exercise

In August 2003, staff members of the S&T Directorate participated in Determined Promise, a Department of Defense (DOD) exercise held in Las Vegas, NV. The exercise demonstrated the military's capability to assist in the response to a natural disaster, a bioterrorism event, and a number of other emergency situations nationwide. The exercise also provided a forum for initiating discussions that will foster interagency cooperation between DHS and USNORTHCOM.

Nuclear Threat Assessments

The S&T Directorate has provided eight rapid nuclear threat assessments for the Federal Bureau of Investigation (FBI), and approximately two dozen assessments on reports of illicit trafficking in nuclear materials for the Department of State and other customers. The Department of Homeland Security has been leading the interagency Nuclear Trafficking Focus Group, which regularly brings together the operational players of all agencies involved in response to and understanding of nuclear smuggling events.

Secondary "Reach Back"

In August 2003, the S&T Directorate's Nuclear Assessment Program stood up a system to provide secondary "reach back" support to operational DHS entities employing radiation detection systems in the field. Secondary reach back provides inspectors with an additional information resource to utilize for the resolution of radiation detection alarms that draws upon experience in the analysis of nuclear smuggling incidents and threat analysis.

Standards

Radiation Detection

The S&T Directorate has developed a suite of four radiation detector standards under the auspices of the American National Standards Institute (ANSI)'s Accredited American Standards Committee on Radiation Instrumentation. The four standards deal with radiation pagers, hand-held dosimetry instruments, radioisotope identifiers and radiation portal monitors. The S&T Directorate has formed three writing groups to prepare Test and Evaluation (T&E) protocols for hand-held radiation detectors, radionuclide identifiers and radiation portal monitors. The writing groups have met in working sessions in San Diego, CA (July 2003) and Las Vegas, NV (September 2003) and have prepared draft T&E protocols. Benchmark testing against these draft protocols has been initiated at four National Laboratories.

Biopathogen Identification

The Science and Technology Directorate has partnered with the Department of Defense, Office of the Secretary of Defense to fund a contract with the Association of Analytical Communities International to develop Reference Methods and Official Methods for bulk assay of *bacillus anthracis.* This work will also permit the comparison of commercially available rapid identification methods (hand-held assays) for *B. anthracis.*

SAFETY Act

On October 10, 2003, Secretary Ridge signed an interim final rule implementing the Support Anti-Terrorism by Fostering Effective Technologies (SAFETY) Act which was a requirement of the *Homeland Security Act of 2002.* The SAFETY Act is designed to encourage the development and rapid deployment of life-saving, anti-terrorism technologies by providing manufacturers and sellers with limited liability risks. The Department is now accepting applications for designation under the Act and evaluating the proposed technologies.

Inter-operability of Communications

SAFECOM: E–Gov Initiative to Improve Inter-operability of Wireless Communications

The Department of Homeland Security is taking steps to boost the ability of the approximately 44,000 local, tribal and State entities and 100 federal agencies engaged in public safety to communicate effectively with one another, particularly during an emergency. SAFECOM is a federal umbrella program under the S&T Directorate that is dedicated to improving public safety response through enhanced interoperable wireless communications. The goal is to enable public safety agencies to talk across disciplines and jurisdictions via radio communications systems, exchanging voice or data with one another on demand and in real time. SAFECOM is providing seed money for the Department of Justice's Integrated Wireless Network program, which will create inter-operability among local, State and federal public safety

agencies in 25 cities. In addition, technical guidance for inter-operable communications that was developed under SAFECOM is included in this year's Office of Domestic Preparedness grants.

Summit on Inter-operable Communications for Public Safety

In June 2003, the S&T Directorate, Project SAFECOM, the National Institute of Standards and Technology (NIST) and the National Institute of Justice hosted a Summit on Inter-operable Communications for Public Safety. The event focused on familiarizing attendees with programs that assist public safety practitioners, including first responders, and is the first national effort ever undertaken to convene all the players. In addition, it provided insight on federal resource needs, how government can leverage existing program successes and resources in the area of standards development, approaches, and products and services. The Summit results provided help in formulating a coordinated approach toward nationwide communications inter-operability.

SAFECOM Vendor Demonstration Day

In August 2003, the Science and Technology Directorate held its first SAFECOM Vendor Demonstration Day, with an overwhelmingly positive response from technology providers. Due to the increasing number of vendor requests to present their technologies to the SAFECOM Program, the S&T Directorate is holding a vendor demonstration day on the last Friday of every month. These Friday sessions will offer a chance for SAFECOM to learn about new technologies for inter-operability, provide a clear process for managing vendor requests, and ensure that every vendor has a fair opportunity to participate.

Information Analysis and Infrastructure Protection Programs

Addressing Threats and Vulnerabilities in the Oil and Gas Industries

The S&T Directorate sponsored and delivered a prototype system to the Information Analysis and Infrastructure Protection (IAIP) Directorate to perform Graphical Information System (GIS) based computer assisted threat and vulnerability mapping of the oil and gas infrastructure in the American Southwest. S&T is also in the process of delivering to IAIP cutting edge visualization, data searching, data correlation, and all-source analytic aids to provide IAIP advanced analytic capabilities integrated with vulnerability information.

Advanced Algorithms for Bio-detectors

Researchers funded by the S&T Directorate's Advanced Scientific Computing Research & Development program achieved an important milestone in the speed acceleration of software used to develop advanced bio-detectors. Scientists have made a pair of related algorithmic advances that will speed the creation of DNA signatures for pathogen detection at considerably reduced cost. These discoveries will result in cheaper, faster, and more reliable bio-detectors for homeland security.

Threat-Vulnerability Mapper

Part of the Threat-Vulnerability Information System, the Threat-Vulnerability Mapper (or TVM), was installed in the analysis center of the Information Analysis and Infrastructure Protection Directorate in December 2003 and is already in constant use. Developed by the S&T Directorate, the TVM provides counterterrorism analysts with a simple, straightforward way to not only depict the geographic distribution of threats across the United States, but also to search the underlying databases for information on the possible actors, agents, potential severity of attacks, and extent of the vulnerabilities to and effects of such attacks. A second TVIS component was delivered to IAIP in January 2003 and should be installed and operational by the end of February 2004.

Critical Infrastructure Protection Decision Support System

On December 24, 2003, S&T's Critical Infrastructure Protection Decision Support System (CIP/DSS) team was asked to conduct a rapid analysis of potential consequences following discovery of a cow in Washington State with bovine spongiform encephalopathy (BSE), commonly known as Mad Cow disease. An analysis was developed within hours using available open literature, past historical data, and the results from an early stage, Dynamic Simulation agriculture model.

Cyber Security

Experimental Infrastructure Network for Cyber Defense

Led by the S&T Directorate, DHS is co-funding with the National Science Foundation a $5.45M, three-year research project to create an experimental infrastructure network to support development and demonstration of next generation informa-

tion security technologies for cyber defense. This project supports national-scale experimentation on emerging security research and advanced development technologies. Called Cyber Defense Technology Experimental Research ("DETER") Network, this is a multi-university project led by the University of California, Berkley.

Evaluation Methods in Internet Security Technology

DHS is co-funding with the National Science Foundation, a second cyber security project called Evaluation Methods in Internet Security Technology (EMIST). EMIST is a testing framework that can be adapted to simulators, emulation facilities, other testbeds, and hardware testing facilities. The framework will include attack scenarios, attack simulators, generators for topology and background traffic, data sets derived from live traffic, and tools to monitor and summarize results. EMSIT is a three-year, $5.6M, multi-university research project that includes Penn State; University of California, Davis; Purdue; and the International Computer Science Institute.

United States Coast Guard

Maritime Surveillance Testbed Prototype

In September 2003, S&T's Homeland Security Advanced Research Projects Agency and the United States Coast Guard planned and funded the South Florida Coastal Surveillance Prototype Testbed, a port and coastal surveillance prototype in Port Everglades, Miami, and Key West areas. The prototype is an evolutionary testbed that:

- Provides an initial immediate coastal surveillance capability in a high priority area
- Offers the Coast Guard and other DHS agencies the means to develop and evaluate CONOPS (Concept of Operations) in a real world environment
- Implements and tests inter-operability among DHS and DOD systems and networks such as the U.S. Navy/Coast Guard Joint Harbor Operations Center (JHOC).
- Tests and evaluates systems and operational procedures
- Becomes the design standard for follow-on systems in other areas and integration with wider area surveillance systems.

The program has two phases; an initial prototype development phase, and an improvements and update phase. The program is expected to begin operations in June 2004 and is funded at $2.4M for FY 2003 and $5M for FY 2004.

Partnerships

Workshop on Scientific Computing in Support of Homeland Security

The Science and Technology Directorate brought together experts from academia, private industry and the national laboratories with staff from various organizations within the Department to understand how the S&T Directorate's advanced scientific computing (ASC) capabilities, centered at the national laboratories, can help address needs across the Department. This workshop, held October 8–9, 2003, has resulted in identifying several areas of potential high payoff for the use of these unique capabilities; two examples are advanced research in data management and information extraction, and research and development of computational simulation tools. The workshop will produce a formal report identifying relevant ASC capabilities and matching them up with identified needs within the Department of Homeland Security for improved operational capabilities.

Infrastructure Subcommittee of the National Science and Technology Council

Staff members of the Science and Technology Directorate had a major role in drafting the first charter for the National Science and Technology Council's (NSTC's) Infrastructure Subcommittee; the Subcommittee's first Co-Chairs are from the S&T Directorate and the Office of Science and Technology Policy. The Subcommittee serves as a forum within the National Science and Technology Council (NSTC) for developing consensus and resolving issues associated with coordinating R&D agendas, policy, and programs to develop and protect the Nation's infrastructure. The Subcommittee will also be the vehicle used by the Department of Homeland Security and the White House Office of Science and Technology Policy to develop the National R&D Plan for Critical Infrastructure Protection.

Homeland Security Standards Panel

The S&T Directorate worked with the American National Standards Institute (ANSI) and the National Institute of Standards and Technology (NIST) to establish

a Homeland Security Standards Panel (HSSP) that would coordinate the development of consensus standards among the 280 different standards development organizations. On June 9–10, 2003, the inaugural meeting of the ANSI Homeland Security Standards Panel was held at NIST. Plenary session presentations were given by four S&T Directorate staff members to outline the needs in Department for standards. The panel selected a small list of topics to address with focus workshops. The first of these occurred in September 2003 with a focus on needs for standards in biometrics.

Joint DHS/USDA National Strategy for Foreign Animal Disease

At the request of the Congressional Appropriations Committees for both DHS and the Department of Agriculture (USDA), the two departments have coordinated a report on a national strategy for foreign animal disease. Participants in the joint study included DHS (S&T), USDA (the Agricultural Research Service and the Agriculture and Plant Health Inspection Service), and stakeholder groups. The joint study has prompted an end-to-end review of the national response strategy following the identification of a case of foot-and-mouth disease, including the R&D requirements and gaps for assays, diagnostics, vaccines, and antivirals. Comprehensive roadmaps have been developed for these research areas, in one-, three-, and five-year timeframes. These roadmaps are important elements of program planning for S&T.

National Security Council Attribution Working Group

The S&T Directorate initiated and leads the National Security Council Attribution Working Group, which is revisiting national capabilities to rapidly perform forensic analysis in cases of nuclear and radiological events of any size. This effort is expected to lead to a robust and completely coordinated forensic capability for attribution.

Workshops on Comparative Analysis

S&T's Office of Comparative Studies has sponsored two workshops on identifying analysis techniques and information sources crucial for analyzing the interaction of the terrorist threat with S&T activities. These workshops brought together participants from two DHS directorates, other government entities, academia and private industry and have helped to improve communication between these groups. Important analytical techniques and sources of information were identified and have been utilized. The workshops were also used to establish a set of topics which the office could profitably study. A proposal is being prepared which will solicit work on several of these topics.

Homeland Security Institute, and Homeland Security Science and Technology Advisory Committee

Homeland Security Institute

A formal solicitation was issued in December for the Homeland Security Institute (HSI), and proposals were received in January 2004. Those proposals currently are being evaluated with an expected five-year award by early May 2004. However, current legislation states that the Institute's operation will terminate in November 2005; this issue is of concern to the bidders.

The HSI was mandated by the Homeland Security Act to assist the Secretary and the Department in addressing important homeland security issues that require scientific, technical, and analytical expertise. The Institute will provide a dedicated, high-quality technical and analytical support capability for informing homeland security decision making at all levels. This capability will consist of an extensive program of operational assessments, systems evaluations, technical assessments, and resource analyses comparable to the capability developed and used for decades by the Defense establishment. The Institute will also provide analytical and technical evaluations that support DHS implementation of the SAFETY Act. Finally, the Institute will create and maintain a field operations program that will help further introduce real-world needs and experiences into homeland security is a disciplined and rigorous way.

Homeland Security Science and Technology Advisory Committee

The Homeland Security Science and Technology Advisory Committee (HSSTAC) was formally established in December 2003 and holds its first meeting in February 2004.

The HSSTAC was mandated by the Homeland Security Act to be a source of independent, scientific and technical planning advice for the Under Secretary for Science and Technology. The committee will (1) advise the Undersecretary on the mission goals for the future; (2) provide advice on whether the policies, actions, management

processes, and organization constructs of the Science and Technology Directorate are optimally focused on mission objectives; (3) provide advice on whether the research, development, test, evaluation, and systems engineering activities are properly resourced (capital, financial, and human) to accomplish the objectives; (4) identify outreach activities (particularly in accessing and developing, where necessary, the industrial base of the Nation); and (5) review the technical quality and relevance of the Directorate's programs.

Countermeasures to Man-Portable Air Defense Systems

The S&T Directorate has selected three firms to provide analyses of the economic, manufacturing and maintenance issues needed to support a system to address the potential threat of MAN–Portable Air Defense Systems (MANPADS) to commercial aircraft. The next phase of the program will include development of prototypes using existing technology which will be subjected to a rigorous test and evaluation process. This initiative is not intended to develop new technology, but rather to re-engineer existing technology from military to commercial aviation use.

University and Fellowship Programs

Fellowships and Scholarships

In September 2003, the S&T Directorate named 100 students to the inaugural class of the Department of Homeland Security's Scholars and Fellows Program. The program, which received more than 2,400 applications, supports United States students who choose to pursue scientific careers and perform research in fields that are essential to the homeland security mission. The first class consists of 50 undergraduate students and 50 graduate students who are attending universities across the country majoring in the physical, biological, and social and behavioral sciences including science policy, engineering, mathematics, or computer science. The Directorate has already issued a notice inviting applications from students for the 2004–2005 academic year. The website is *http://www.orau.gov/dhsed/*.

University Centers of Excellence

The Science and Technology division has created the Homeland Security Centers Program that supports university-based centers of excellence dedicated to fostering homeland security mission critical research and education. The program has established the first Center of Excellence focused on risk analysis and modeling related to the economic consequences of terrorism at the University of Southern California, partnering with the University of Wisconsin at Madison, New York University and the University of California at Berkeley. A request for proposals has been issued for the second and third Centers of Excellence, which will focus on animal-related and post-harvest food agro-terrorism.

Homeland Security Advanced Research Projects Agency

Near-Term Technologies

In May 2003, the Science and Technology Directorate's Homeland Security Advanced Research Projects Agency (HSARPA) released a Broad Agency Announcement through the Technical Support Working Group for near-term technologies that can be rapidly prototyped and deployed to the field. A total of 3,344 responses as received in the following broad categories: chemical, biological, radiation and nuclear countermeasures; personnel protection; explosives detection; infrastructure protection; physical security; improvised device defeat; and investigative support and forensics. The first contract award went to North Carolina State University for the development of the next-generation of structural fire fighting personal protective equipment.

Detection Systems

The S&T Directorate reviewed and selected proposals for funding in response to its Research Announcement for Detection Systems for Biological and Chemical Countermeasures, which was published through the Technical Support Working Group. In September 2003, the Homeland Security Advanced Research Projects Agency (HSARPA) held its first Bidders Conference in Washington, DC. Approximately 420 private sector and university representatives attended the event and over 500 white papers were submitted. Finalists have been selected for negotiation, and work has already begun in a number of the more important areas.

Virtual Cyber Security Center

On December 13, 2003, a Request for Proposals and Statement of Work for technical and administrative support for the virtual Cyber R&D Center was published to seven capable performers listed on the GSA schedule. The deadline for response

was December 15, 2003, and two responsive proposals were received. A three million dollar technical, management, and administrative contract was awarded to SRI International on February 2, 2004, to support the functions of the HSARPA Cyber R&D Center. The Cyber R&D Center will be the primary S&T interface with the academic and industrial cyber security research communities.

Small Business Innovation Research (SBIR) Program Solicitation

On November 13, 2003, the Homeland Security Advanced Research Projects Agency (HSARPA) issued a Small Business Innovation Research (SBIR) Program Solicitation. The purpose of this solicitation was to invite small businesses to submit innovative research proposals that address eight high-priority DHS requirements:

- New system/technologies to detect low vapor pressure chemicals (e.g., Toxic Industrial Chemicals)
- Chemical and biological sensors employing novel receptor scaffolds
- Advanced low cost aerosol collectors for surveillance sensors and personnel monitoring
- Computer modeling tool for vulnerability assessment of U.S. infrastructure
- Ship compartment inspection device
- Marine Asset Tag Tracking System
- Automatic Identification System tracking and collision avoidance equipment for small boats
- Advanced Secure Supervisory Control and Data Acquisition (SCADA) and related distributed control systems.

By the December 15, 2003, deadline 374 proposals had been received. The evaluation is complete and 66 proposers entered negotiation for Phase I contracts beginning February 11, 2004.

SAFECOM Vendor Demonstration Day

SAFECOM held a Vendor Demonstration Day on January 30, 2004. SAFECOM's Vendor Day allows several communications equipment and service providers to present their products and/or technologies for SAFECOM. Responses from the SAFECOM Request for Information in November 2003 were used to select vendors for this event. Each vendor selected represents a different approach to solving the communications and inter-operability problems facing first responders.

International Programs

Agreement with Canada on Border and Infrastructure Security

On October 3, 2002, Secretary Tom Ridge and Canadian Deputy Prime Minister John Manley initialed an agreement on Science and Technology Cooperation for protecting shared critical infrastructure and enhancing border security. The S&T Directorate is participating in a Working Group to develop near-term deliverables and projects to protect shared critical infrastructure such as bridges, dams, pipelines, communications and power grids; to develop surveillance and monitoring technologies to enhance the ability to disrupt and interdict terrorists; and to develop technologies for detecting the illicit transportation of chemical, biological, radiological, and nuclear weapons.

Weapons of Mass Destruction and Incident Management

Between March and December of 2003, the Office of Weapons of Mass Destruction Operations and Incident Management (WMDO–IM) provided surveillance and operational incident response to the Homeland Security Operations Center and law enforcement officials on 24 separate occasions. In addition, the WMDO–IM provided operational support to the Homeland Security Operations Center during Hurricane Isabel and the Northeast blackout.

The WMDO–IM established a scientific reach-back and rapid decision support capability through the Scientific and Technical Analysis and Response Teams (START). In addition to activating the START teams during the Code Orange time period in December 2003, WMDO–IM provided technical expert consultations on threats to the Nation's water resources and responded to concerns about impacts of solar flares.

WMDO–IM helped develop the Initial National Response Plan (INRP) and its National Incident Management System; the INRP represents a significant first step towards an overall goal of integrating the current family of federal domestic prevention, preparedness, response, and recovery plans into a single all-discipline, all-hazards plan.

WMDO–IM provided technical support to the Homeland Security Operations Center (HSOC), assessing vulnerabilities and actions the HSOC can take to improve the ability to resist a chemical or biological terrorist attack.

WMDO–IM, with the Defense Threat Reduction Agency and Nuclear Regulatory Commission, developed curriculum for a week-long training workshop on weapons of mass destruction for the Central Intelligence Agency University. Also in the area of education and training, WMDO–IM established a homeland security medical executive training course.

BIOGRAPHY FOR CHARLES E. MCQUEARY

Dr. Charles E. McQueary was appointed by President Bush as Under Secretary for Science and Technology of the Department of Homeland Security and confirmed by the U.S. Senate in March of 2003.

Dr. McQueary leads the research and development arm of the Department, utilizing our nation's scientific and technological resources to provide federal, State and local officials with the technology and capabilities to protect the homeland.

Prior to joining Homeland Security, Dr. McQueary served as President, General Dynamics Advanced Technology systems, in Greensboro, N.C. Earlier in his career, Dr. McQueary served as President and Vice President of business units for AT&T, Lucent Technologies, and as a Director for AT&T Bell Laboratories.

In addition to his professional experience, Dr. McQueary has served his community in many leadership roles as Chair of the Board, and Campaign Chair, of the United Way of Greensboro; Member of the Board of Trustees of North Carolina Agricultural and Technical State University; Member of the Guilford Technical Community College President's CEO Advisory Committee; Member of Board of World Trade Center North Carolina; Chair for Action Greensboro Public Education Initiative; and as a Member of the Board of Guilford County Education Network.

Dr. McQueary holds both a Ph.D. in Engineering Mechanics and an M.S. in Mechanical Engineering from the University of Texas, Austin. The University of Texas has named McQueary a Distinguished Engineering Graduate.

Chairman BOEHLERT. Thank you very much, Dr. McQueary, and I would note that the Department of Homeland Security has not even celebrated its first anniversary yet. It stood up last March 1, and I think you and Governor Ridge and the team there have done a remarkable job under very difficult circumstances. I think all of us expect miracles, but miracles don't happen in government; they only happen on the ice, which is a plug for the new movie, "Miracle on Ice," about the 1980 Lake Placid Olympic U.S. winning team.

Mr. Bond, welcome back.

STATEMENT OF MR. PHILLIP J. BOND, UNDER SECRETARY OF COMMERCE FOR TECHNOLOGY, DEPARTMENT OF COMMERCE

Mr. BOND. Thank you very much, Mr. Chairman, Ranking Member Gordon, Members of the Committee. It is great for me to be here. I wanted to add a thought on Rita Colwell's departure, which is kind of a double whammy for me; I will not only miss the great pleasure and privilege of working with her, but also have to, as the Chair alluded to, share the great national treasure we call Arden Bement with NSF and also join you, Mr. Chairman, in looking forward to his return to NIST.

I want to thank the Committee, and especially the Chairman for your continued support and leadership on all innovation issues. You have been a constant and strong voice for the science and technology community. I appreciate that, especially in the areas, of course, of basic research, cyber security, and nanotechnology that are so important to the future. It is a privilege for me to be here this morning to join my colleagues and discuss the President's R&D budget, which is an unprecedented total of $132 billion, representing a 44 percent increase since the President took office.

The President's focus on science and technology is reflected as well in the Department of Commerce's R&D portfolio, the portfolio that consists, really, of work done in our two primary technical research bureaus: NOAA, which the Committee is very familiar with, and the Technology Administration, which I am privileged to oversee.

The fiscal year 2005 budget request for NOAA is $3.4 billion, and in TA, it is $529.8 million. Of course the lion's share, $521.5 million, of that is at NIST. Through these two bureaus, the Department of Commerce is engaged in critical cutting-edge research in high priorities, such as nanotechnology, climate change, environmental sciences, information technology, and manufacturing technology.

As you can tell from the witnesses you have heard already, these are cross-cutting, multiple agency missions, which is one reason why Secretary Evans has put special emphasis on collaboration, and it has resulted in Admiral Lautenbacher at NOAA serving as the Chair of the NSTC Committee on Environment and Natural Resources. And I have been serving as the co-chair of the Committee on Technology with long-time Science Committee staffer, Richard Russell.

The Commerce budget reflects the priorities of the Department in continuing its commitment to creating conditions for economic growth and employment opportunity by promoting innovation, entrepreneurship, competitiveness, and stewardship. Resources to enhance these services have, in some cases, been shifted from various lower-priority programs and, to be sure and to underscore, the Administration, as Rita Colwell mentioned, has had to make some very tough choices. Some otherwise well-managed and successful programs could not be given the highest priority for funding.

That said, the Department has an ambitious agenda to leverage our science and technology resources, and we look forward to working with you and Members of the Committee as these proposals move through the legislative process.

In my time today, I want to just briefly touch on NOAA, because I know the Committee has scheduled a separate hearing on that and talk a little bit about the work at NIST. The President's request for NOAA in 2005 is $3.4 billion, an increase of about $147 million over the 2004 request. NOAA believes the proposed budget maintains and enhances programs that enable our scientific understanding of the oceans and atmosphere while also sustaining the Nation's environmental health and economic vitality. The request allows NOAA to develop the science necessary to improve weather, water, and ecosystem forecasts of the future as well as give policy makers, like this committee, the data they need to make important decisions related to climate change. The budget request supports NOAA's core activities including its fisheries and oceans program, climate research, weather forecasting capabilities, and satellite infrastructure necessary to support these functions.

In the Technology Administration, the fiscal year 2005 funding priorities support programs to promote U.S. industries in their effort to meet the President's national priorities of fostering economic growth, defending the homeland, defending the national security, and winning the war on terrorism. The requests for NIST specifi-

cally were—we are exceedingly proud of our world-class research and Nobel Prize winning scientists. And the President's request there reflects his appreciation of the role that technology plays in both economic security and homeland security.

The request is five percent more than the 2004 request and includes $417.5 million for the NIST laboratories: for that core function, a 9.4 percent increase. $59.4 million is requested for badly needed facilities' maintenance and upgrades.

And let me just say for a moment, if I might, Mr. Chairman, that the support for the thrust of this budget, and the support for the core efforts at NIST, is so critical. We have witnessed in recent years a trend of shortfalls in funding for the NIST laboratories, and it does threaten to undermine the very core measurements and standards infrastructure upon which so much of the Nation's scientific, technological, and industrial enterprises rest. It will be incumbent upon us to do as much outreach as possible with our partners across the federal enterprise, and we look forward to doing that. In fact, I would observe, for the record, that in the 2004 omnibus, all but two of our labs, NIST's core labs, actually received real reductions. And so the challenge going into 2005 is very real.

Moving on to more details, there is a $39.2 million request for the Manufacturing Extension Partnership to help small U.S. manufacturers become more competitive and productive.

Recognizing the importance of manufacturing to our economy, Secretary Evans did release a comprehensive manufacturing strategy aimed at improving the climate for manufacturers in our global marketplace. A key part of that strategy includes stable support for the MEP and new steps to review and improve its efficiency. To emphasize competition in global markets, for example, the Department is exploring ways to team MEP field agents to coordinate better with the International Trade Administration at Commerce.

As noted, there is no funding for the ATP in the fiscal year 2005 budget. There are, however, several major new R&D initiatives. $15.6 million to support advanced manufacturing, $18.6 million for work related to public safety and security, $16.2 million to develop advanced measurement capabilities to meet the needs of 21st century science and industry. Key to this, of course, is the AML [Advanced Measurement Laboratory].

AML also has funding challenges in instrumentation, but it will become increasingly critically important to nanomanufacturing to have advances there. In fact, the NNI initiative touches almost every aspect of NIST in its core efforts and standards and metrology, which really are the linchpin to commercializing so much of that technology.

NIST is also requesting an increase to address an issue increasingly important to the U.S. economy, which is to equip U.S. manufacturers with the tools to track and respond to international technical standards that block their entry to market. Our formal submission gives you more detail on these and other initiatives.

The budget also includes a very important $8.3 million for the NIST Center for Neutron Research, one of the world's true jewels, so important in many areas. You have more details in my submission there. And critically needed funding in facilities that Mr. Udall, in particular, is so aware of out in Boulder.

With that, let me stop and just observe, Mr. Chairman, that the focus of the President on creating growth and opportunity is beginning to pay off. We are headed in the right direction: unemployment falling down, manufacturing up, job creation up over the last four months. And we look forward to working with the Committee to keep that going.

[The prepared statement of Mr. Bond follows:]

PREPARED STATEMENT OF PHILLIP J. BOND

Mr. Chairman and Members of the Committee, I am pleased to join with my fellow Administration colleagues in your review of the President's Fiscal Year (FY) 2005 budget request for science and technology programs. As you have already heard from Dr. Marburger, the President's budget focuses on leadership in science and technology by calling for an unprecedented $132 billion investment in research and development (R&D) that represents a 44% increase since President Bush took office.

I want to thank the Committee, especially Chairman Boehlert, for your continued support and leadership on innovation issues. You have been a constant and strong voice for the science and technology community—especially in the areas of basic research and nanotechnology. I look forward to continuing to work together to ensure America remains the world leader in the science and technology field.

The President's focus in the area of science and technology is reflected in the Department of Commerce R&D portfolio. The Commerce budget maintains substantial R&D investments in our two primary technical research bureaus, the Technology Administration (TA) and the National Oceanic and Atmospheric Administration (NOAA). Through these two bureaus, the Department of Commerce is engaged in critical cutting-edge research in high-priority areas of technological innovation such as nanotechnology, information technology, and manufacturing technology.

The Fiscal Year 2005 President's budget request for TA is $529.8 million in total discretionary budget authority, which includes $8.3 million for the Office of Technology Policy and $521.5 million for the National Institute of Standards and Technology (NIST). The Fiscal Year 2005 President's budget request for NOAA is $3.4 billion in total discretionary budget authority.

Additionally, both TA and NOAA have developed strong collaborations with other federal science and technology agency partners to develop interagency activities and coordinate major R&D initiatives in these high-priority areas. Given the budget pressures facing our nation, this approach is necessary in order to fund important federal science and technology programs. Working with my fellow panelists and others throughout the Administration, at the Department of Commerce, we have been engaged in extending efforts to cross agency boundaries to strengthen our research and development capabilities.

Secretary Evans is proud that the Department has been able to play a leadership role in interagency coordination, especially through the President's National Science and Technology Council (NSTC). For example, I co-chair the NSTC Committee on Technology and NOAA Administrator Admiral Lautenbacher chairs the NSTC Committee on Environment and Natural Resources. The Secretary has tasked us to continue developing partnership models inside and outside of our building to leverage the Nation's science and technology enterprise. By developing new methods for collaboration within Commerce and with other agencies, the Administration can maximize the best use of our scarce federal dollars.

Mr. Chairman, in my time with you today, I wish to review the Department's science and technology budget priorities for the upcoming fiscal year, as reflected in our TA and NOAA requests. Since I know that the Committee intends to hold a separate hearing in the near future just on the NOAA budget with Admiral Lautenbacher, I will give a short summary of the NOAA FY 2005 priorities before discussing the proposed budget priorities for the Technology Administration.

The Commerce budget priorities reflect the Department's continuing commitment to creating conditions for both economic growth and employment opportunity by promoting innovation, entrepreneurship, competitiveness, and stewardship. To enhance these services, resources have been shifted from various lower priority programs. To be sure, the Administration has had to make some very tough choices and some otherwise well-managed and successful programs could not be given a high priority for funding. The Department, however, has an ambitious agenda to use our science and technology resources and we look forward to working with you as these proposals move through the legislative process.

National Oceanic and Atmospheric Administration (NOAA)

The President's Fiscal Year 2005 budget request totals $3.4 billion for NOAA, including program increases of $146.9 million over the FY 2004 request. NOAA believes that the proposed budget maintains and enhances the programs that enable our scientific understanding of the oceans and atmosphere, while also sustaining the Nation's environmental health and economic vitality. The budget request allows NOAA to develop the science necessary to improve weather, water and ecosystem forecasts of the future, as well as give policy-makers the data they need to make important decisions related to climate change.

The Fiscal Year 2005 budget request supports the NOAA core activities, including its fisheries and oceans programs, climate research activities, weather forecasting capabilities, and the satellite infrastructure necessary to support these functions. In addition, the request continues to focus on maintenance and safety issues associated with NOAA facilities, vessels, and aircraft.

In order to meet international standards for research surveys and substantially improve the quality of fishery research, NOAA requests an investment of $34 million to complete NOAA's third fisheries survey vessel. NOAA will also seek to expand its focus on climate research by devoting $19 million of new funding to address the critical knowledge gaps identified in the recently released Climate Change Science Program Strategic Plan. Finally, NOAA will continue to improve its weather forecasting abilities by requesting funding to expand air quality forecasts nationwide and investing in improved long-range weather forecasting. The Department will also request an additional $56 million for the continued development of next-generation geosynchronous and polar orbiting satellite programs.

Some additional highlights of the NOAA FY 2005 budget proposal include:

- Weather and Water—to serve society's needs for weather and water information—The $1.41 billion request is an increase of $58.1 million over base goal levels.
- Climate—to understand climate variability and change to enhance society's ability to plan and respond—The $369.3 million request is an increase of $28.7 million over base goal levels.
- Ecosystems—to protect, restore and manage the use of coastal and ocean resources through ecosystem approach to management—The $1.158 billion request is an increase of $145.3 million over base goal levels.
- Commerce and Transportation—support the Nation's commerce with information for safe, efficient and environmentally sound transportation—NOAA is requesting $252.1 million, an increase of $23.1 million over base levels, to address this goal.

Technology Administration (TA)

TA's Fiscal Year 2005 funding priorities for its $529.8 million budget support programs that promote U.S. industries to meet the President's national priorities of fostering economic growth, providing for a secure homeland and defense, and winning the war on terrorism. TA meets these priorities by helping to shape an economic climate that leads to innovation and growth; investing in the NIST core mission of measurements, standards, research, and services to industry; and supplying NIST scientists with the laboratory equipment and facilities necessary for world-class research.

TA's NIST is well-known to the Members of this committee, but the world-class research of its award-winning scientists and engineers can often be overlooked because the NIST contributions are often made at the beginning of the R&D process—invaluable contributions that pave the way for the rapid commercialization needed to advance our economy.

NIST has been often referred to as the "crown jewel" of our federal laboratory system. It is a well-deserved title because there is no other federal lab that industry relies on as much as NIST. Industry needs the critical NIST metrology research standards for measurement, testing, analysis, and protocols that allow for inter-operable products to be created, new products to be developed based on consensus standards, assurances that products meet conformity assessment requirements, and the ability to effectively bring their innovation from the laboratory to the marketplace.

NIST is an important component of the TA mission, performing world-class research to enhance productivity, facilitate trade, and improve the quality of life. Given the rapidly accelerating pace of technology development and change during the past decade, NIST has had to remain agile and flexible in order to make the best use of its resources. One telling measure of NIST's success is that nearly 30

economic impact studies by independent experts calculate that every dollar invested in NIST measurement and standards programs returns at least three dollars in economic benefits to the Nation. Indeed, most NIST programs return substantially more.

The President's request for NIST for FY 2005 reflects his appreciation of the role technology plays in both our economic security and our homeland security while holding the line on non-defense spending. This request—which is five percent more than his request for FY 2004—includes $417.5 million for the NIST laboratories and $5.4 million for the Baldrige National Quality Program. Another $59.4 million is requested for badly needed facilities maintenance and upgrades.

The Manufacturing Extension Partnership (MEP) requests $39.2 million to help small U.S. manufacturers become more competitive and productive. Through its network of centers, MEP makes it possible for small U.S. firm to tap into the knowledge, skill sets, and experience of leading manufacturing, business, and technology specialists from across the country. With MEP as a resource, American manufacturers have at their disposal the latest and most efficient technologies, processes and business practices.

Recognizing the importance of manufacturing to our economy, Secretary Evans recently released a comprehensive manufacturing strategy aimed at improving the climate for manufacturers in a global marketplace. With the Manufacturing Index rising to its highest level in nearly 20 years this past December and new orders at its highest level since 1950, it appears America's manufacturing sector is expanding and moving in the right direction, but there is more work to be done. President Bush will not rest until every American who wants to work can find a job. So, the Secretary has asked all bureaus within the Department of Commerce to be engaged in support of manufacturers. A key part of the manufacturing strategy outlined in Secretary's Evans' report includes stable support for the MEP and new steps to review and improve its efficiency. To emphasize competition in global markets, for example, the Department is exploring ways to team MEP field agents will team directly with trade promotion specialists in the International Trade Administration (ITA) to leverage ITA's connections and in-depth knowledge of industrial sectors. The report also recommends that MEP hold a recompetition of all centers that focuses on improving effectiveness and efficiency.

There is no funding proposed for the Advanced Technology Program (ATP) in the Fiscal Year 2005 budget. The total NIST request of $521.5 million is $89 million less than our FY 2004 appropriation. While there is an increase in the FY 2005 funding request for the NIST laboratories, the overall request for NIST is a net decrease due to the termination of funding for the ATP.

It is also important to note that a recent trend of shortfalls in funding for the NIST laboratories threatens to undermine the very core measurements and standards infrastructure upon which our nation's scientific, technological and industrial enterprises depend. Accordingly, the President's request for NIST incorporates several major new R&D initiatives, including $15.6 million to support advanced manufacturing, $18.6 million for work related to public safety and security, and $16.2 million to develop advanced measurement capabilities to meet the needs of 21st century science and industry.

Last June the President's Science Advisor laid out the Administration's priorities for science and technology R&D in the FY 2005 budget. These NIST R&D initiatives are an excellent fit with those priorities:

- Under R&D for Combating Terrorism, the NIST public safety proposal includes a funding increase to advance national measurement capabilities in the detection of chemical, biological, radiological, nuclear, or explosive materials; in biometric identification, and in cyber security. This work is closely coordinated with the Department of Homeland Security and other national security agencies.
- In the rapidly developing field of Nanotechnology, the NIST advanced manufacturing proposal encompasses a wide array of measurement tools, devices, measurement technologies, standards, and data to provide a critical measurement and standards infrastructure for leading-edge developments in nanotechnology manufacturing areas. These are assignments directly fulfilling NIST's mission and in line with NIST's role in both the *National Nanotechnology Initiative* and the *21st Century Nanotechnology Research and Development Act* (P.L. No. 108–153) that was spearheaded by this committee.
- In line with the Administration's priority emphasis on Molecular-level Understanding of Life Processes, NIST's Measurement Science initiative includes the development of measurements and test methods that will be critical to developments in biosystems and health, such as work in the measurement and

analysis of gene and protein expression, nanobiotechnology and DNA and protein markers.

- In Networking and Information Technology, NIST initiatives in Public Safety and Advanced Measurement include IT research ranging from improvements in the state of the art of computer and network security—especially wireless and industrial control systems—to cutting-edge research in the emerging field of quantum information science, which promises to lead to advanced information processing systems with phenomenal increases in information storage and processing speeds.
- NIST also maintains a substantial effort in the areas of Environment and Energy, including unique research facilities and expertise related to various aspects of hydrogen fuel cells, covering the entire spectrum from fundamental science to successful commercialization.

NIST is also requesting an FY 2005 funding increase to address an issue increasingly important to the U.S. economy—equipping U.S. manufacturers with the necessary tools to track and effectively respond to the development of international technical standards, particularly where they impact the access of U.S. manufacturers to international markets.

Our formal submission gives you additional details of these and other research initiatives, but I would like to draw the Committee's attention in particular to two very important facilities issues at NIST.

This budget includes a proposed initiative for $8.3 million for capability improvements at the NIST Center for Neutron Research. The NCNR is one of NIST's truly unique facilities and an extraordinarily valuable resource for the Nation's research community. Neutron beams—especially the low-energy "cold" beams available at NCNR—have become an indispensable research tool in materials science, biotechnology, chemistry, engineering, and physics. The NCNR has been cited as the highest performing and most used neutron facility in the United States. In fact, it draws nearly twice the number of users at the Nation's other three neutron sources combined.

Success, however, has strained the resources of the NCNR, which now serves over four times the number of users predicted in 1987 when it was first funded. Fuel- and fuel-related costs have spiraled. As a result, NIST's ability to operate the facility to its maximum utility and to meet the growing demands of the U.S. research community has been seriously curtailed.

The NCNR initiative will not only address this serious problem in operating expenses but also allow NIST to expand significantly its literally irreplaceable service to the Nation's industrial and academic researchers with new instrumentation and analysis methods. The types of research that would benefit include:

- The study of proteins, that could lead to the development of new drug therapies, new anti-toxins and improved vaccines;
- The development of ultra-high sensitivity detection methods for environmental pollutants as well as explosives and other terrorist materials;
- The study of the workings of complex cellular level biological systems; and
- The development of more efficient fuel cells, batteries and semiconductors.

The FY 2005 budget also includes a $25.7 million initiative primarily devoted to pressing issues of facility obsolescence at NIST's Boulder, Colorado, laboratories.

Years of inadequate funding for maintenance and upgrades have left the NIST laboratories in Boulder, Colorado, severely deteriorated and obsolete. That these facilities have managed to provide U.S. researchers one of the world's most accurate and precise time and frequency standards, for example, or the world's most accurate voltage standards, is a tribute to the ingenuity and patience of the NIST staff, but it comes at a price.

- Poor heating and air-conditioning controls have prevented on-time delivery of specialized superconducting integrated circuit chips to defense contractors, instrument makers and other NIST clients.
- Researchers making sophisticated measurements of magnetic fields—important work done in support of the data storage industry—often must wait an hour or more for lab temperatures to stabilize sufficiently to work.
- Outages, power spikes, brownouts, and other problems are damaging sensitive equipment, delaying research program, and necessitating expensive repairs.

NIST conservatively estimates a 10 percent loss in productivity at the Boulder Labs *purely* due to environmental problems in obsolete buildings. And that does not begin to touch on the staff safety issues.

We appreciate that this committee has long been a strong advocate for NIST. I am grateful that you understand that an investment in NIST returns great benefits to our nation as the only federal laboratory with the express mission of working with industry. I look forward to working with you in addressing NIST's needs so that its world-class scientists and engineers can continue to serve our nation effectively.

Conclusion

Mr. Chairman, the Department of Commerce's R&D portfolio is not only strengthening our science and technology portfolio but also strengthening our nation's economy. The past few weeks have confirmed that America's economy is strong, and growing stronger. The Nation's unemployment rate fell to 5.6 percent in January, the fourth consecutive monthly decline, and we added 112,000 new jobs, the largest single month increase since December of 2000. Overall, the Nation has added 366,000 jobs in the past five months. There's more evidence of a strengthening economy. Manufacturers report new orders. GDP rose at a 6.1 percent in the second half of 2003, the fastest pace in nearly 20 years. Inflation remains low, and our nation's home ownership rate just reached an all-time high. All of these are signs that our economic recovery is becoming a lasting expansion. The President has made economic recovery a national priority and I know the Members of this committee are equally as passionate about this issue. At the Department of Commerce we are fully engaged in economic recovery by providing leadership in science and technology, with TA and NOAA leading our R&D efforts.

BIOGRAPHY FOR PHILLIP J. BOND

Phillip J. Bond was sworn in as Under Secretary of Commerce for Technology on October 30, 2001. He was nominated by President George W. Bush on September 4, and confirmed by the United States Senate on October 23, 2001.

From January 2002 through January 2003, Bond served concurrently as Chief of Staff to Commerce Secretary Don Evans. In his dual role, Bond worked closely with the Secretary to increase market access for U.S. goods and services and further advance America's technological leadership at home and around the world.

Under Secretary Bond serves as the principal advisor to Secretary Evans on science and technology policy to maximize technology's contribution to America's economic growth. In this context, Mr. Bond's primary responsibilities are to supervise policy development and direction among the Office of Technology Policy (OTP), the National Institute of Standards and Technology (NIST), and the National Technical Information Service (NTIS). He also serves on four committees of the President's National Science and Technology Council (NSTC), a Cabinet-level council established by the President to coordinate science, space, and technology policy within the Federal research and development enterprise.

One of Mr. Bond's top priorities has been to transform the Technology Administration into the pre-eminent portal between the Federal Government and the U.S. technology industry. In that regard, he directs TA efforts to advocate on behalf of U.S. technology in the federal policy-making process. Some of the high priority issues that he is involved in include support for American innovation and entrepreneurship; the converging fields of nanotechnology, biotechnology, information technology and the cognitive sciences; strengthening U.S. technology cooperation with other countries, especially in areas such as standards development; education and training of a high tech U.S. workforce; and an array of issues of concern to the telecommunications and information technology industries.

Mr. Bond was recognized in Scientific American Tech Leaders of 2003 (December 2003) for promoting nanotechnology effectively within the executive branch.

His experience in the private sector includes serving as Director of Federal Public Policy for the Hewlett-Packard Company, a position he held immediately before joining Commerce, and previously serving as Senior Vice President for Government Affairs and Treasurer of the Information Technology Industry Council.

From 1993 to 1998, Phil Bond served as Chief of Staff to Congresswoman Jennifer Dunn (R–WA). He was Principal Deputy Assistant Secretary of Defense for Legislative Affairs from 1992 to 1993 for then-Defense Secretary Dick Cheney. Earlier, he was Chief of Staff and Rules Committee Associate for Congressman Bob McEwen (R–OH) from 1990 to 1992. From 1987 to 1990, he served as Special Assistant to the Secretary of Defense for Legislative Affairs. He is a graduate of Linfield College in Oregon.

Chairman BOEHLERT. Thank you very much, Mr. Bond. You have a good story, and you tell it well. I can understand why you are smiling. I would like to see bigger smiles on Dr. Colwell's and Dr. Orbach's faces, but I will say, knowing the Committee, as I do, both sides, we agree with your comments on NIST. And one of the challenges that we face is to undo the damage we did in the omnibus bill earlier in this year, because we have got some problems for NIST. Now it is fine for next year, as this budget documents, but it is this year that we have got to get by. And I mean, to zero out the funding for research on standards for new election equipment is goofy. I mean, in view of what happened in the last election, we have got to figure out how to get that money in there, and it is $2.8 million. And I am concerned that NIST is going to have to reduce its workforce between now and the next fiscal year by 50 to 100 people. That is not good news.

But the good news is I think the Administration recognizes the importance of NIST and has been very forthcoming in proposing a favorable budget for the next fiscal year, and we will work with you to see that it is embraced.

With that, we go next to Dr. Orbach. Welcome back, Doctor. It is good to see you once again.

STATEMENT OF DR. RAYMOND L. ORBACH, DIRECTOR, OFFICE OF SCIENCE, DEPARTMENT OF ENERGY

Dr. ORBACH. Thank you, Chairman Boehlert. Chairman Boehlert, Ranking Member Gordon, Members of the Committee, it is my great pleasure to join you today to present the Department of Energy fiscal year 2005 budget submission.

I also wish to personally thank Dr. Rita Colwell for her leadership of the National Science Foundation and for the very close and cooperative relationship that my program has experienced under her direction. We greatly appreciate it and wish you well, Rita.

I would like to summarize very briefly the programs of the Department of Energy, which fall under this committee's jurisdiction, and greater detail is in my written testimony.

For the Office of Science, we are requesting $3.4 billion—$3.341 billion for fiscal year 2005. This request will set us on the path toward addressing the challenges that face our nation in the 21st century. The Office of Science supports a broad array of research disciplines. This year, we will increase our activities across the board in areas such as computation, biological research, environmental remediation, fusion energy, materials, and nanotechnology R&D. It is also the first year that we will make explicit use of our laboratories to diversify our scientific workforce.

The Office of Science recently released *"Facilities for the Future of Science: A Twenty-Year Outlook,"* which sets an ambitious, prioritized agenda for scientific discovery over the next two decades. Our budget will begin the process of developing those facilities, which we believe to be essential for the advancement of science and, indeed, for job creation in our country.

For nuclear energy, we are requesting $410 million to continue the Department's commitment to nuclear energy as a clean, reliable, and affordable source of energy for this Nation. This request includes funding to establish a new laboratory for nuclear energy

research, development, demonstration, and education. The conceptual design for the next-generation nuclear plant continues to work to pave the way for a new nuclear power plant order in the near future, and international efforts to develop new reactor and fuel cycle technologies.

For our Office of Energy Efficiency and Renewable Energy, we are requesting $1.25 billion, reflecting the Secretary's view that this Office should take a revolutionary, rather than evolutionary, approach to meet the National Energy Policy goals. One such revolutionary approach is embodied in the President's FreedomCAR and Hydrogen Fuel Initiative. Together with programs in fossil energy, nuclear energy, and science, the Department's 2005 commitment to this initiative is more than $300 million.

Fossil energy's program supports the President's top initiatives for energy, security, clean air, climate change, and coal research. The $728.9 million request supports the development of lower cost, more effective pollution control technologies for coal, extended options for reducing greenhouse gases, and the Nation's energy security by providing a short-term emergency response, such as the Strategic Petroleum Reserve, or longer-term response, such as gas hydrates.

Mr. Chairman, I believe the Department's fiscal year 2005 budget submission meets the Nation's critical needs for energy, environmental, and national security at a difficult time in our history.

I appreciate the opportunity to present the 2005 budget, and I greatly appreciate the support of this committee for the energy and research goals of this country. Thank you.

[The prepared statement of Dr. Orbach follows:]

PREPARED STATEMENT OF RAYMOND L. ORBACH

Introduction

Mr. Chairman, Members of the Committee, it is a pleasure to join you today to present the Department of Energy's FY 2005 budget submission and to focus on the details that fall under the purview of this committee. The Department appreciates the support of the Chairman and the Members of the Committee over the past years and I look forward to working with you to ensure that our nation stays at the leading edge of science and technology in the 21st Century. I am testifying on behalf of Mr. Robert Card, Under Secretary for Energy, Science and the Environment at the Department of Energy.

The Department of Energy in the last three years has been guided by the Administration's commitment to better management in government and the importance of scientific discovery. Our cadre of scientists and engineers from all disciplines create and inspire dynamic discoveries that change our way of life. To complement our support for scientific discovery, the Department has fully embraced the President's Management Agenda—emphasizing performance, aligning resources directly to mission priorities, and integrating these objectives into the management of human capital. This synergy has sharpened the focus of the Department of Energy and, I believe, will result in dramatic achievements of real importance to the everyday lives of Americans.

Setting Priorities

Three years ago, Secretary Abraham defined the Department's primary mission to support national security and established a series of programmatic objectives in national security, energy, environmental quality, science, and corporate management. From this mission and departmental objectives, the Department's Strategic Plan was developed, setting in place a long-range programmatic vision. To orient the Department to results and performance, the long-range planning goals and targets have been articulated into shorter-term performance goals, objectives, and metrics that are reflected throughout the FY 2005 detailed budget justifications.

The FY 2005 budget request of $24.3 billion is formulated to meet four broad programmatic goals and objectives in corporate management:

- **Defense—***To protect our national security by applying advanced science and nuclear technology to the Nation's defense.* The FY 2005 budget proposes $9.0 billion to meet defense-related objectives. The budget request maintains commitments to the nuclear deterrence requirements of the Administration's Nuclear Posture Review and continues to fund a strong strategy to mitigate the threat of weapons of mass destruction.
- **Energy—***To protect our national and economic security by promoting a diverse supply and the delivery of reliable, affordable, and environmentally sound energy.* The FY 2005 budget requests $2.7 billion to meet energy-related objectives. The budget request maintains Presidential objectives to promote energy security and reliability through increases in coal research and development, hydrogen production and fuel cell powered vehicles, advanced nuclear energy technologies, and electric transmission reliability.
- **Science—***To protect our national and economic security by providing a world-class scientific research capacity and advancing scientific knowledge.* The FY 2005 budget seeks $3.4 billion to meet science-related objectives. The budget request continues the Administration's commitment to the Nation's scientific strength by maintaining essential facility and national laboratory operations, and support for research in the exciting fields of fusion, advanced scientific computing, nanoscience, microbial genomics, high energy and nuclear physics and the research tools that enable forefront scientific research.
- **Environment—***To protect the environment by providing a responsible resolution to the environmental legacy of the Cold War and by providing for the permanent disposal of the Nation's high level radioactive waste.* The FY 2005 budget requests $8.4 billion to meet environmental-related objectives. The budget request includes significant increases to fulfill commitments to accelerate environmental cleanup, maintain the schedule to establish a permanent geologic nuclear waste repository by 2010, and accelerate assistance to employees of the Cold War nuclear weapons complex who may have been harmed by their work.

All of the programs and activities highlighted in this Budget depend heavily upon advanced research and development and could not be achieved were it not for the world-leading scientific and engineering capabilities available in the Department's national laboratories and at universities across the Nation.

I am proud to tell you that the Department of Energy was ranked the most improved cabinet-level agency in the most recent scorecard to assess implementation of the President's Management Agenda (PMA). The scorecard, which evaluates agency performance in the areas of human capital, competitive sourcing, financial management, e-government, and budget/performance integration, was issued by OMB in January and recognized the Department as one of the agencies "leading the pack with regard to management improvement."

Let me now review the program areas under this committee in greater detail.

The Office of Science

Overview

The Office of Science FY 2005 budget request is $3.432 billion, a $68,451,000 decrease over the FY 2004 appropriation levels. When $140,762,000 for FY 2004 Congressionally-directed projects is set aside, there is an increase of $72,311,000 in FY 2005. When compared to the FY 2004 comparable President's Request, the FY 2005 request increases $104,885,000 or 3.2 percent. This request allows us to increase support for high priority scientific research, increase operations at our key scientific user facilities, keep existing construction projects on schedule, and support new initiatives. This request, coming at a time of tight overall federal budgets, is also a demonstration of the Administration's support for basic research and the role that fundamental science plays in keeping our nation strong and secure.

When I joined the Office of Science after a career as a university scientist and administrator, I came with an appreciation for the four key roles that the Office plays in the U.S. research effort: *We provide solutions to our nation's energy challenges,* contributing essential scientific foundations to the energy, national, and economic security missions of the U.S. Department of Energy (DOE). *We are the Nation's leading supporter of the physical sciences,* investing in research at over 280 universities, 15 national laboratories, and many international research institutions. *We deliver the premier tools of science to our nation's science enterprise,* building and

operating major research facilities for open access by the science community. *We keep the U.S. at the forefront of intellectual leadership,* supporting the core capabilities, theories, experiments, and simulations to advance science.

This FY 2005 budget request will set us on the path toward addressing the challenges that face our nation in the 21st Century. The Office of Science has recently released *Facilities for the Future of Science: A Twenty-Year Outlook* which sets an ambitious agenda for scientific discovery over the next two decades. The priorities established in this plan—which is not a budget document—reflect national priorities set by the President and the Congress, our commitment to the missions of the Department of Energy, and the views of the U.S. scientific community. Pursuing these priorities will be challenging, but they hold enormous promise for the overall well-being of all of our citizens. We will soon release an updated *Office of Science Strategic Plan* that is fully integrated with the Facilities Plan, the Department's new Strategic Plan, and the President's Management Agenda—including the R&D Investment Criteria and OMB's Program Assessment Rating Tool. The FY 2005 budget request begins to implement these plans.

DOE's Office of Science leads the world in the conception, design, construction, and operation of these large-scale devices. These machines have enabled U.S. researchers to make some of the most important scientific discoveries of the past 70 years, with spin-off technological advances leading to entirely new industries. More than 19,000 researchers and their students from universities, other government agencies (including the National Science Foundation and the National Institutes of Health), private industry, and those from abroad use DOE facilities each year. These users are both growing in number and diversity.

We credit our outstanding track record in construction to a highly effective management and review process. We have been so successful that our process is now considered a "best practice" across the U.S. government by OMB and OSTP, and we are being consulted by CERN, Europe's premier particle physics laboratory, on construction of their Large Hadron Collider, a facility to which the United States (through a partnership between the Office of Science and the National Science Foundation) is contributing $531 million.

Because of the extraordinarily wide range of scientific disciplines required to support facility users at national laboratories, and the diversity of mission-driven research supported by the Office of Science, we have developed an interdisciplinary capability that is extremely valuable to some of the most important scientific initiatives of the 21st Century. There is also a symbiotic relationship between research and research tools. Research efforts advance the capabilities of the facilities and tools that in turn enable new avenues of research.

The Office of Science funds research at DOE's national laboratories and at 280 colleges and universities located across the country. Excluding funds used to construct or operate our facilities, approximately half of our base research funding goes to support research at universities and institutes. Academic scientists and their students are funded through peer-reviewed grants, and SC's funding of university research has made it an important source of support for graduate students and postdoctoral researchers in the physical sciences during their early careers.

Office of Science research programs are managed in seven major areas, including an enhanced effort in Workforce Development for Teachers and Scientists.

Advanced Scientific Computing Research (ASCR)

ASCR significantly advances scientific simulation and computation, applying new approaches, algorithms, and software and hardware combinations to address the critical science challenges of the future, and provides access to world-class, scientific computation and networking facilities to the Nation's scientific community to support advancements in practically every field of science and industry. The ASCR budget also supports the *Scientific Discovery through Advanced Computing (SciDAC)* program—a set of coordinated investments across all Office of Science mission areas with the goal of achieving breakthrough scientific advances via computer simulation that were impossible using theoretical or laboratory studies alone.

The FY 2005 budget includes $204 million for ASCR to advance U.S. leadership in high performance supercomputing, networking and software development to continue to advance the transformation of scientific simulation and computation into the third pillar of scientific discovery. The request includes $38 million for the *Next Generation Computer Architecture (NGA)* to acquire additional advanced computing capability for existing users, and for longer-term research and development on new architectures for scientific computers. Enhancements are supported for ASCR facilities—the Energy Sciences Network (ESnet) and the National Energy Research Scientific Computing Center (NERSC). The request also includes $8.5 million for the new *Atomic to Macroscopic Mathematics* research effort to provide the research sup-

port in applied mathematics needed to break through the current barriers in our understanding of complex physical processes.

Basic Energy Sciences (BES)

The BES program is a principal sponsor of fundamental research for the Nation in the areas of materials sciences and engineering, chemistry, geosciences, and bioscience as it relates to energy. This research underpins the DOE missions in energy, environment, and national security; advances energy-related basic science on a broad front; and provides unique user facilities for the scientific community and industry.

For FY 2005, the Department requests $1,064 million for BES including $209 million to continue to advance nanoscale science through atomic- and molecular-level studies in materials sciences and engineering, chemistry, geosciences, and energy biosciences. This supports Project Engineering Design (PED) and construction on four Nanoscale Science Research Centers (NSRCs) and a Major Item of Equipment for the fifth and final NSRC. NSRCs are user facilities for the synthesis, processing, fabrication, and analysis of materials at the nanoscale. The request also includes $80.5 million for construction and $33.1 million for operation of the Spallation Neutron Source and $50 million for design and long lead procurement of the Linac Coherent Light Source, a revolutionary x-ray laser light source. With these tools, we will be able to understand how the compositions of materials affect their properties, watch proteins fold, see chemical reactions, and design matter for desired outcomes.

The FY 2005 budget request also includes $29 million for activities that support the President's Hydrogen Fuel Initiative. This research program is based on the BES workshop report *"Basic Research Needs for the Hydrogen Economy,"* which highlights the enormous gap between our present capabilities and those required for a competitive hydrogen economy.

Biological and Environmental Research (BER)

BER advances energy-related biological and environmental research in genomics and our understanding of complete biological systems, such as microbes that produce hydrogen; in climate change, including the development of models to predict climate over decades to centuries; developing science-based methods for cleaning up environmental contaminants; in radiation biology, providing regulators with a stronger scientific basis for developing future radiation protection standards; and in the medical sciences, by developing new diagnostic and therapeutic tools, technology for disease diagnosis and treatment, non-invasive medical imaging, and biomedical engineering such as an artificial retina that will restore sight to the blind. For FY 2005, the Department requests $502 million for BER which does not provide continued support for the $141 million in Congressional earmarks from FY 2004.

Research on microbes through the *Genomics: GTL* program, addressing DOE energy and environmental needs, continues to expand from $63.4 million in FY 2004 to $67.5 million in FY 2005. The request also supports initiation of Project Engineering Design (PED) activities for the GTL Facility for the Production and Characterization of Protein and Molecular Tags, a facility that will help move the excitement of the *Genomics: GTL* systems biology research program to a new level by greatly increasing the rate and cost-effectiveness with which experiments can be done. DOE, through the *Genomics: GTL* program, will attempt to use genetic techniques to harness microbes to consume pollution, create hydrogen, and absorb carbon dioxide.

Fusion Energy Sciences (FES)

The FES program advances the theoretical and experimental understanding of plasma and fusion science, including a close collaboration with international partners in identifying and exploring plasma and fusion physics issues through specialized facilities. This includes: 1) exploring basic issues in plasma science; 2) developing the scientific basis and computational tools to predict the behavior of magnetically confined plasmas; 3) using the advances in tokomak research to enable the initiation of the burning plasma physics phase of the Fusion Energy Sciences program; 4) exploring innovative confinement options that offer the potential of more attractive fusion energy sources in the long-term; 5) focusing on the scientific issues of nonneutral plasma physics and High Energy Density Physics; 6) developing the cutting edge technologies that enable fusion facilities to achieve their scientific goals; and 7) advancing the science base for innovative materials to establish the economic feasibility and environmental quality of fusion energy.

When the President announced that the U.S. would join in the International Thermonuclear Experimental Reactor (ITER) project he noted that "the results of ITER will advance the effort to produce clean, safe, renewable, and commercially available fusion energy by the middle of this century." To this end, the Department

continues its commitment to the future of Fusion Energy Science research with a request of $264.1 million, slightly above the FY 2004 level. Within that amount, DOE's funding in preparation for ITER in FY 2005 is $38 million, $30 million more than last year. Of this $38 million, $7 million is for engineers who support the International Team and for the qualification of vendors for superconducting cable. The other $31 million is for experiments on our tokamak facilities and for component R&D in our laboratories and universities that is closely related to our ongoing program but which is focused on ITER's specific needs.

Fabrication of the National Compact Stellarator Experiment (NCSX) will continue with a target of FY 2008 for the initial operation of this innovative new confinement system that is the product of advances in physics understanding and computer modeling. In addition, work will be initiated on the *Fusion Simulation Project* to provide an integrated simulation and modeling capability for magnetic fusion energy confinement systems over a 15-year development period. The Inertial Fusion Energy research program will be redirected toward high energy density physics research based on recommendations of the recently established Interagency Task Force on High Energy Density Physics.

High Energy Physics (HEP)

HEP advances understanding of dark energy and dark matter, the striking imbalance of matter and antimatter in the current universe, the basic constituents of matter, and the possible existence of other dimensions, collectively revealing the key secrets of the birth, evolution, and final destiny of the universe. HEP expands the energy frontier with particle accelerators to study fundamental interactions at the highest possible energies, which may reveal the rest of the universe: new particles, new forces or undiscovered dimensions of space and time; explain how everything came to have mass; and illuminate the pathway to the underlying simplicity of the universe.

For FY 2005, the Department requests $737 million for the HEP program, about the same as in FY 2004. Highest priority in HEP is the operations, upgrades and infrastructure for the two major HEP user facilities at the Fermi National Accelerator Laboratory (Fermilab) and the Stanford Linear Accelerator Center (SLAC), to maximize the scientific data generated.

In 2005, the Neutrinos at the Main Injector (NuMI) facility will be complete and the beam line will be commissioned. The FY 2005 budget request also supports engineering design activities for a new Major Item of Equipment, the BTeV ("B Physics at the TeVatron") experiment at Fermilab to extend current investigations that uses modern detector technology to increase our data rate by more than two orders of magnitude. Research, development and design funding continues in FY 2005 on the proposed Supernova Acceleration Probe (SNAP) experiment for the DOE/NASA Joint Dark Energy Mission (JDEM).

Nuclear Physics (NP)

NP supports innovative, peer reviewed scientific research to advance knowledge and provide insights into the nature of energy and matter, and in particular, to investigate the fundamental forces which hold the nucleus together, and determine the detailed structure and behavior of the atomic nuclei. Nuclear science plays a vital role in studies of astrophysical phenomena and conditions of the early universe. At stake is a fundamental grasp of how the universe has evolved, an understanding of the origin of the elements, and the mechanisms of supernovae core collapse. The program builds and supports world-leading scientific facilities and state-of-the-art instruments necessary to carry out its basic research agenda. Scientific discoveries at the frontiers of Nuclear Physics further the Nation's energy-related research capacity, which in turn provides for the Nation's security, economic growth and opportunities, and improved quality of life.

The FY 2005 budget request of $401 million gives highest priority to exploiting the unique discovery potentials of the facilities at the RHIC and Continuous Electron Beam Accelerator Facility (CEBAF) by increasing operating time by 26 percent compared with FY 2004. R&D funding is provided for the proposed Rare Isotope Accelerator (RIA) and 12 GeV upgrade of CEBAF at Thomas Jefferson National Accelerator Facility.

Operations of the MIT/Bates facility will be terminated as planned, following three months of operations in FY 2005 to complete its research program. This facility closure follows the transitioning of operations of the Lawrence Berkeley National Laboratory 88Inch Cyclotron in FY 2004 from a user facility to a dedicated facility for the testing of electronic circuit components for use in space (using funds from other agencies) and a small in-house research program. These resources have been

redirected to better utilize and increase science productivity of the remaining user facilities and provide for new opportunities in the low-energy subprogram.

Workforce Development for Teachers and Scientists

The mission of the Workforce Development for Teachers and Scientists program is to continue the Office of Science's long-standing role of training young scientists, engineers, and technicians in the scientifically and technically advanced environments of our National Laboratories.

The FY 2005 budget request of $7.66 million provides $1.5 million for a *Laboratory Science Teacher Professional Development* activity. About 90 participating teachers will gain experience and enhance their skills at five or more DOE laboratories in response to the national need for science teachers who have strong content knowledge in the classes they teach. A new $0.5 million *Faculty Sabbatical Fellowship* activity will provide sabbatical opportunities for 12 faculty from minority serving institutions (MSIs). This proposed activity is an extension of the successful *Faculty and Student Teams (FaST)* program where teams of faculty members and two or three undergraduate students, from colleges and universities with limited prior research capabilities, work with mentor scientists at a National Laboratory to complete a research project that is formally documented in a paper or presentation.

The Office Energy Efficiency and Renewable Energy

Research, development and deployment of advanced clean energy technologies are making a difference in everyday lives of Americans today and will make an even larger difference tomorrow. Advanced energy efficient technologies and practices that use less energy, as well as renewable energy technologies that produce power and heat more cleanly than conventional sources, are well on their way to becoming today's answers to tomorrow's energy and environmental challenges.

The Department allocates more funding for energy efficiency and renewable energy than it does for any other energy activity. The Fiscal Year 2005 Budget Request for the Office of Energy Efficiency and Renewable Energy (EERE) is $1.25 billion, a $15.3 million increase over the Fiscal Year 2004 comparable funding level. This budget builds on successes already achieved and delivers on promises and commitments made in past budget requests.

The Department's Fiscal Year 2005 budget request continues to implement the priorities established in the National Energy Policy Report and the Department of Energy Strategic Plan, and reflects priorities set in the EERE Strategic Program Review. EERE also used the research and development investment criteria called for in the President's Management Agenda to evaluate its portfolio and focus its research and development dollars on long-term, potentially high payoff activities that require federal involvement to be successful and achieve public benefit.

The Fiscal Year 2005 budget reflects Secretary Abraham's challenge to EERE that it take a bold approach to EERE-sponsored work. Recognizing increasing dependence on energy from areas of the world that can be unstable, and recognizing that questions surrounding climate change can increase the focus on reducing greenhouse gas emissions, the Secretary directed that the program take a revolutionary, rather than an evolutionary approach to meeting National Energy Policy Report's goals of increased energy security, greater freedom for Americans in their energy choices, and reduced costs and environmental impacts associated with those choices.

One such revolutionary approach is embodied in the President's *FreedomCAR Partnership and Hydrogen Fuel Initiative,* the goal of which is an industry decision by 2015 to commercialize hydrogen-powered fuel cell vehicles. To the extent that hydrogen is produced from domestic resources in an environmentally sound manner, hydrogen fuel cell vehicles will require no petroleum-based fuels and emit no criteria pollutants or carbon dioxide, and their commercial success would essentially remove personal transportation as an environmental issue and substantially reduce our dependence on foreign oil. The *FreedomCAR Partnership and Hydrogen Fuel Initiative* now include both auto manufacturers and energy companies, helping to ensure that hydrogen will be available and affordably priced when fuel cell vehicles are ready for commercialization. Over the past year significant R&D advances have increased confidence that the 2015 goal is realistic and attainable. Together with programs in Fossil Energy, Nuclear Energy and Science, the Department's Fiscal Year 2005 commitment to the *Hydrogen Fuel Initiative* is $227 million.

The Fiscal Year 2005 budget requests $10.2 million to continue our Solid State Lighting program begun last year. Solid State Lighting represents a revolutionary approach to lighting our homes and businesses that has the potential to more than double the efficiency of general lighting systems in the coming decades, conserving enough electricity nationally to power the states of Arizona, Colorado, and Mississippi. Advancing the technology and lowering the cost of organic and inorganic

light emitting diodes will lead to more efficient, flexible and functional lighting technology in the future. The budget for Solid State Lighting keeps the Department on track to overcome technical barriers to everyday use of these innovative technologies.

In the deployment area, the Fiscal Year 2005 budget request maintains the President's commitment to increase funding for the Weatherization Assistance Program by $1.4 billion over ten years to help low-income Americans who spend a disproportionately high share of their income on energy. This year's budget request will allow the weatherization of nearly 119,000 low-income homes, saving $1.30 in energy costs for every dollar invested.

Federal Energy Management Program (FEMP) alternative financing programs and technical assistance helps federal agencies access private sector financing to fund energy improvements through Energy Savings Performance Contracts and Utility Energy Service Contracts at no net cost to taxpayers. In addition, FEMP promotes a whole-building design strategy and provides awards to groups within federal agencies that achieve excellence in energy management. The Fiscal Year 2005 request is $17.9 million for FEMP to continue reducing federal energy consumption. As FEMP's core activities have evolved, efficiencies have increased, enabling a reduced funding level in Fiscal Year 2005.

The Office of Electric Transmission and Distribution

The mission of the newly created Office of Electric Transmission and Distribution (OETD) is to lead a national effort to modernize and expand America's electricity delivery system to ensure a more reliable and robust electricity supply, as well as economic and national security. This is vital to the Department's strategic goal: to protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy.

The August 14, 2003 blackout demonstrated the electric grid's strategic importance to our nation. President George Bush stated in September 2003: ". . .it's clear that the power grid needs an overhaul. It needs to be modernized. As we go into an exciting new period of American history, we want the most modern electricity grid for our people. . .we need more investment; we need research and development.. . ."

OETD requests $90.9 million for FY 2005 to increase reliability, which reflects a 12.4 percent increase over the FY 2004 comparable appropriation. This effort includes research, development, demonstration, technology transfer, and education and outreach activities in partnership with industry, businesses, utilities, States, other federal programs and agencies, universities, national laboratories, and other stakeholders.

Neither government nor industry alone can satisfy the Nation's electric infrastructure needs. The *National Delivery Technologies Roadmap* provides a framework for all of the electric industry stakeholders to work together to achieve common aims. The call for grid modernization is coming from all levels of leadership. The President's 2004 State of the Union request to Congress to "modernize our electricity system" reiterated the Administration's objectives first outlined in the *National Energy Policy* [May 2001] and then reinforced, in more detail, in the *National Transmission Grid Study (NTGS)* [May 2002].

Modernizing the grid will involve time, resources, and unprecedented levels of cooperation. The Nation's aging electric infrastructure—and the increasing requirements placed on it—have contributed to market inefficiencies and electricity congestion in several regions. These conditions could lead to more outages, more power quality disturbances, higher prices, and the less efficient use of resources. We must act now or risk even greater problems in the future.

The GridWise and GridWorks Initiatives

OETD's FY 2005 Budget request—reflecting the Administration's efforts to modernize and expand the electric grid—includes $10.5 million for the new GridWorks Initiative and the existing GridWise Initiative, which are aimed at reducing the likelihood and impact of reliability events, such as blackouts.

GridWise denotes a modernized electric infrastructure framework where open, but secure, communication and information technologies, and associated standards, are used throughout the electric grid to enhance reliability and robustness, promote economic efficiencies, and provide value and choices to electricity consumers. The GridWise program activity (software-centric) comprises the intelligence—or brains—behind a modern electric grid that incorporates GridWorks (hardware-centric) technology.

GridWorks is focused on advanced equipment applications, taking an integrated approach to the entire electric system. It bridges the gap between the laboratory

prototypes of the base programs and the application needs of the electric industry. GridWorks uses the facilities at DOE's National Laboratories to accelerate the development and testing of advanced conductors, which can increase much-needed transmission line capacity. It complements GridWise's architectural software development by developing and demonstrating associated hardware, such as sensors. GridWorks pursues advanced power electronic breakthroughs to provide faster means of limiting transmission problems before they propagate through the electric system.

High Temperature Superconductivity

OETD's FY 2005 Budget request includes a $10.9 million increase for High Temperature Superconductivity R&D to develop second generation wire usable in cables, generators, transformers, and motors—equipment that crosscuts the entire electric power value chain.

High temperature superconductors are a good example of advanced materials that have the potential to revolutionize electric power delivery in America. The prospect of transmitting large amounts of power through compact underground corridors, with minimal electrical losses and voltage drop over long distances, could significantly enhance the overall energy efficiency and reliability of the electric system, while reducing fuel use, air emissions, and any physical footprint. Also, breakthroughs in basic science are rapidly applied in the area of high temperature superconductivity. For instance, benefits from nanoscience research are accelerating progress in superconductivity wire development.

The Office of Fossil Energy

Fossil Energy's programs focus on supporting the President's top initiatives for energy security, clean air, climate change, and coal research. FY 2005 Fossil Energy programs:

- Support the development of lower cost, more effective pollution control technologies embodied in the President's Coal Research Initiative or help diversify the Nation's future sources of clean-burning natural gas to meet the goals of President's Clear Skies initiative;
- Expand the Nation's technological options for reducing greenhouse gases either by increasing power plant efficiencies or by capturing and isolating these gases from the atmosphere as called for by the President's Global Climate Initiative;
- Or measurably add to the Nation's energy security by providing a short-term emergency response, such as the Strategic Petroleum Reserve, or a longer-term alternative to imported oil, such as hydrogen and methane hydrates.

The President's Coal Research Initiative

Fossil Energy's FY 2005 Budget continues to meet the President's clean coal commitment by providing $447 million for the Coal Research Initiative, an increase of 40 percent or $126.5 million over last year's request.

Under President Bush's leadership, budget requests for coal R&D have more than doubled over historical amounts and appropriations.

Clean Coal Power Initiative and FutureGen

The *Clean Coal Power Initiative (CCPI)* is a key component of the National Energy Policy to address the reliability and affordability of the Nation's electricity supply, particularly from its coal-based generation. The FY 2005 Budget includes $287 million for CCPI, of which $237 million is for FutureGen, the world's first zero-emissions hydrogen and electicity producing power plant. FutureGen will establish the capability and feasibility of co-producing electricity and hydrogen from coal with essentially zero emissions, including carbon sequestration and gasification combined cycle, both integral components of the zero emissions plant of the future.

The CCPI is a cooperative, cost-shared program between the government and industry to rapidly demonstrate emerging technologies in coal-based power generation and to accelerate their commercialization. The Nation's power generators, equipment manufacturers, and coal producers help identify the most critical barriers to coal's use in the power sector. Technologies are selected with the goal of accelerating development and deployment of coal technologies that will economically meet environmental standards, while increasing the efficiency and reliability of coal power plants.

CCPI is especially significant because it directly supports the President's Clear Skies initiative. The first projects included an array of new cleaner and cheaper concepts for reducing sulfur dioxide, nitrogen oxides, and mercury—the three air pollutants targeted by the Clear Skies initiative.

Since last year, the Department has made significant progress on a new generation of environmentally-clean coal technologies.

The "first round" in the Clean Coal Power Initiative—the centerpiece of the President's clean coal commitment—attracted three dozen proposals for projects totaling more than $5 billion. In early 2003, we announced the first winners of the competition—eight projects with a total value of more than $1.3 billion, more than one billion dollars of which would be provided by the private sector. These projects are expected to help pioneer a new generation of innovative power plant technologies that could help meet the President's Clear Skies and climate change objectives.

Competitive solicitations for the "second round" will be made in early 2004 and are open to technologies capable of producing any combination of heat, fuels, chemicals, or other useful by-products in conjunction with electricity generation.

FutureGen. In order to assure that FutureGen is successful, it will be supported in FY05 by a clean coal R&D effort at a proposed level of $46.5 million. It will be focused on all the key technologies needed—such as carbon sequestration, membrane technologies for oxygen and hydrogen separation, advanced turbines, fuel cells, coal to hydrogen conversion, gasifier related technologies, and other technologies.

Carbon Management

Several Clean Coal projects also help expand the menu of options for meeting the President's climate change goal of an 18 percent reduction in greenhouse gas intensity (carbon equivalent per GDP) by 2012, primarily by boosting the efficiencies of power plants (meaning that less fuel is needed to generate electricity with a corresponding reduction in greenhouse gases).

Carbon management has become an increasingly important element of our coal research program. Carbon sequestration—the capture and permanent storage of carbon dioxide—has emerged as one of our highest priorities in the Fossil Energy research program—a priority reflected in the proposed budget of $49 million in FY 2005.

Continuing in FY 2005, one of the cornerstones of our carbon sequestration program will be a national network of regional partnerships. This Secretarial initiative, which I announced last year, will bring together the Federal Government, state agencies, universities, and private industry to begin determining which options for capturing and storing greenhouse gases are most practicable for specific areas of the country.

Funding from the Fossil Energy program will be combined with funding from the Office of Nuclear Energy and the Office of Energy Efficiency and Renewable Energy to competitively fund technology R&D with the greatest potential to reduce, avoid, or sequester gas emissions.

Hydrogen

Another aspect of the President's Clean Coal Research Initiative is the production of clean fuels from coal. Hydrogen has emerged as a major priority within the Administration and the Department of Energy as a clean fuel for tomorrow's advanced power technologies (such as fuel cells) and for future transportation systems. Within the Fossil Energy program, we have allocated $16 million for research into new methods for making hydrogen from coal.

Advanced Research

To provide fundamental scientific knowledge that benefits all of our coal technology efforts, our FY 2005 Budget includes $30.5 million for advanced research in such areas as materials, coal utilization science, analytical efforts, and support for coal research at universities (including historically black and other minority institutions).

Other Power Systems Research and Development

We are also proposing $23 million for continued development of fuel cells with an emphasis on lower-cost technologies that can contribute to both Clear Skies emission reductions, particularly in distributed generation applications, and Climate Change goals by providing an ultra-high efficiency electricity-generating component for tomorrow's power plants. Distributed power systems, such as fuel cells, also can contribute to the overall reliability of electricity supplies in the United States and help strengthen the security of our energy infrastructure.

Natural Gas Research

The President's Clear Skies Initiative also provides the rationale for much of the department's $26.0 million budget request for natural gas research. Even in the ab-

sence of new environmental requirements, natural gas use in the United States is likely to increase by 50 percent by 2020.

Our natural gas research program, therefore, is directed primarily at providing new tools and technologies that producers can use to diversify future supplies of gas. Emphasis will be increased on research that can improve access to onshore public lands, especially in the Rocky Mountain region where much of our undiscovered gas resource is located.

A particularly important aspect of this research will be to develop innovative ways to recover this resource while continuing to protect the environmental quality of these areas.

We also plan to establish a new industry-led, university consortia-based program to develop breakthrough technologies that can help assure a continued supply of affordable natural gas beyond 2015. The focus of this program will be on projects that could revolutionize the way natural gas is supplied in the United States—a focus that is well beyond the type of research industry is now doing.

Natural gas storage will also assume increasing significance in the United States as more and more power plants require consistent, year-round supplies of natural gas. Toward this end, we will initiate a nationwide, industry-led consortium that will examine ways to improve the reliability and efficiency of our nation's gas storage system and explore opportunities for LNG facility siting.

Over the long-term, the production of natural gas from hydrates could have major energy security implications. Hydrates are natural gas-bearing, ice-like formations in Alaska and offshore.

U.S. Geological Survey estimates indicate U.S. gas hydrates resources are larger by several orders of magnitude than previously thought and dwarf the estimated 1,400 trillion cubic feet of conventional recovered gas resources and reserves in the United States.

This huge resource warrants a new look at advanced technologies that might one day reliably and cost-effectively detect and produce natural gas from methane hydrates. Hydrate production, if it can be proved technically and economically feasible, has the potential to shift the world energy balance away from the Middle East. Understanding hydrates can also improve our knowledge of the science of greenhouse gases and possibly offer future mechanisms for sequestering carbon dioxide. For these reasons, we are continuing a research program to study gas hydrates with a proposed funding level of $6.0 million.

Oil Technology Development

The President's NEP calls attention to the continued need to strengthen our nation's energy security by promoting enhanced oil (and gas) recovery and improving oil (and gas) exploration technology through continued partnerships with public and private entities.

At the same time, however, we recognize that if the federal oil technology R&D program is to produce beneficial results, it must be more tightly focused than in prior years. Consequently, our FY 2005 Budget request of $15.0 million reflects a reorientation of the program toward those areas where there is clearly a national benefit.

One example is the use of carbon dioxide (CO_2) injection to enhance the recovery of oil from existing fields. CO_2 injection is a proven enhanced oil recovery practice that prolongs the life of some mature fields, but the private sector has not applied this technique to its fullest potential due to insufficient supplies of economical CO_2. A key federal role to be carried out in our proposed FY 2005 program will be to facilitate the greater use of this oil recovery process by integrating it with CO_2 captured and delivered from fossil fuel power plants.

We will also refocus much of our Oil Technology program on a new Domestic Resource Conservation effort that will target partnerships with industry and universities to sustain access to marginal wells and reservoirs. These aging fields account for 40 percent of our domestic production and contain billions of barrels of oil that might still be recovered with ever-improving technology.

A high priority effort in FY 2005 will be to develop "micro-hole" technology. Rather than developing just another new drilling tool, the federal program will integrate "smart" drilling systems, advanced imaging, and enhanced recovery technologies into a complete exploration and production system. Micro-hole systems may offer one of our best opportunities for keeping marginal fields active because the smaller-diameter wells can significantly reduce exploration costs and make new drilling between existing wells ("infill" drilling) more affordable.

Using breakthrough technology like this to keep marginal fields in production preserves the opportunity to eventually apply even more advanced innovations that

could recover even larger quantities of domestic crude that traditional oil recovery methods currently leave behind.

Other Fossil Energy Activities

Our budget also includes $124.8 million for other activities in our Fossil Energy program, including $106.0 million for headquarters and field office salaries, $6.0 million for environmental restoration, $3.0 million for federal matching funds for cooperative research and development projects at the University of North Dakota and the Western Research Institute, $1.8 million for natural gas import/export responsibilities, and $8 million for advanced metallurgical research at our Albany Research Center.

Petroleum Reserves. The Strategic Petroleum Reserve and Northeast Home Heating Oil Reserve are key elements of our nation's energy security. Both serve as response tools for the President to use to protect U.S. citizens from disruptions in commercial energy supplies.

Strategic Petroleum Reserve. The President has directed us to fill the Strategic Petroleum Reserve to its full 700 million barrel capacity. The mechanism for doing this is a cooperative effort with the Minerals Management Service to exchange royalty oil from federal leases in the Gulf of Mexico. We have been able to accelerate fill from an average of 60,000 barrels per day at the start of the President's initiative to a rate of 130,000 barrels per day.

Because of the President's "royalty in kind" initiative, we have achieved the Reserve's highest inventory level ever, now at 638 million barrels. Our goal remains to have a full inventory of 700 million barrels by the end of calendar 2005.

Our FY 2005 Budget for the SPR is $177.1 million, all of which is now in our facilities development and operations account. We do not require additional funds in the oil acquisition account because charges for transporting "royalty in kind" oil to the SPR are now the responsibility of the oil supplier. Also, because we have the authority to "borrow" funds from other Departmental accounts to support an emergency SPR drawdown, we no longer require the same amount of standby funding in this account.

Northeast Home Heating Oil Reserve. We are requesting $5.0 million for the Northeast Home Heating Oil Reserve, the same level as last year. The 2-million barrel reserve remains ready to respond to a Presidential order should there be a severe fuel oil supply disruption in the Northeast. A key element of this readiness is a new online computerized "auction" system that we implemented to expedite the bidding process. Installing and testing the electronic system (including tests with prospective commercial bidders) has been a major element of the Office of Fossil Energy's role in implementing the "e-government" initiatives in the President's management agenda.

Naval Petroleum and Oil Shale Reserves. The FY 2005 Budget request of $20.0 million funds continued operations. The Rocky Mountain Oilfield Testing Center (RMOTC), established at the Naval Petroleum Reserve No. 3 in Wyoming, will be funded at $3 million. We also are working on proposals to transfer the Naval Petroleum Reserve No. 2 in California to the Department of the Interior by the end of FY 2005, although we anticipate that transition and certain environmental compliance activities will continue into FY 2005. We also expect to be able to reduce our funding requirements for equity redetermination studies for the Government's portion of the Elk Hills Naval Petroleum Reserve No. 1, which was divested in 1998. Of the four producing zones for which final equity shares had to be finalized, three have been completed; the fourth (the Shallow Oil Zone) is expected to be finished in FY 2005.

The Office of Nuclear Energy, Science and Technology

Overview

The FY 2005 budget proposal continues the Department's commitment to refining the benefits of nuclear power as a clean, reliable and affordable source of energy for this nation. The proposed $410 million investment in the Department's nuclear energy program includes funding to establish a new laboratory for nuclear energy research, development, demonstration and education; preconceptual design work for the Next Generation Nuclear Plant; continued work with utilities to pave the way for an industry order for a new nuclear power plant in the near future; and continued work with other countries to develop new reactor and fuel cycle technologies.

This budget request moves forward the Department's commitment to support the President's priorities to fortify U.S. energy independence and security while making significant improvements in environmental quality through the deployment of nonemitting generation capacity by the end of the decade. It also strengthens our nation's nuclear education infrastructure, and recommends increased support for the

Nuclear Hydrogen Initiative, which will take high temperature nuclear energy systems for clean hydrogen production from concept to reality. Finally, this request supports funds for the Advanced Fuel Cycle Initiative, which is aimed at developing proliferation-resistant fuel cycle technologies to reduce the volume and toxicity of commercial spent nuclear fuel and maximize energy from nuclear fuel.

Please allow me to explain in more detail how this budget proposal continues to advance the Department's nuclear energy initiatives.

Development of the Idaho National Laboratory

DOE's Nuclear Energy Research Center. This budget supports the Secretary's realignment of the mission at the current Idaho National Engineering and Environmental Laboratory to a focus on nuclear energy research and development. The Department is in the process of establishing the Idaho National Laboratory, which will combine the resources of the INEEL and the Argonne-West site. As the Department's leading center of nuclear research and development, a core mission of this laboratory is advanced nuclear reactor and fuel cycle technologies, including the development of space nuclear power and propulsion technologies. The new Idaho National Laboratory will play a vital role in the research and development of enabling technologies for the Next Generation Nuclear Plant, which will support the Department's long-term vision of a zero-emissions future free of reliance on imported energy.

The Department issued a Request for Proposals last week to find a management team to reduce costs and build expertise at the INL. The Department's nuclear energy program involves the collective talents of universities, the private sector, international partners and many of our other national laboratories—Argonne, Los Alamos, Sandia and Oak Ridge among them. The rebuilding of the Department's nuclear power research and development program, however, will be centered at INL. While environmental cleanup remains an important focus at the Idaho site, real progress is being made that will aid in the expansion of nuclear research and development. Within the 2005 budget, an additional $44 million is requested to manage laboratory infrastructure and security.

Generation IV Nuclear Energy Systems

The Generation IV program continues to support the Department's work to develop advanced reactor technologies for commercial deployment in the 2015 to 2030 timeframe. These advanced reactor concepts offer significant improvements in sustainability, proliferation resistance, physical protection, safety and economics. Generation IV nuclear energy systems will not only be safe, economic and secure, but also include energy conversion systems that produce valuable commodities such as hydrogen, desalinated water and process heat. These features make Generation IV reactors ideal for meeting the President's energy and environmental objectives.

The development of these reactors is being led by the Generation IV International Forum, a group of 10 leading nuclear nations (Argentina, Brazil, Canada, France, Japan, the Republic of Korea, the Republic of South Africa, Switzerland, the United Kingdom and the United States), plus Euratom. The forum has selected six promising technologies for next-generation nuclear energy systems. While the Department is supporting research on several reactor concepts, this budget proposal places priority on the Next Generation Nuclear Plant (NGNP), a Very-High Temperature Reactor. This emphasis reflects the NGNP's potential for economically and safely producing electricity and hydrogen without emitting greenhouse gases. FY 2005 NGNP activities will be focused on research and development of fuels and structural materials for high-temperature, high-radiation environments, and continuing the concept design activities initiated in FY 2004. Research and development for the other Generation IV systems will focus on establishing technical and economic viability, and the resulting core and fuel designs and materials requirements.

Nuclear Hydrogen Initiatives

Hydrogen offers significant promise as a future energy technology, particularly for the transportation sector. The use of hydrogen in transportation will reduce U.S. dependence on foreign sources of petroleum, enhancing national security. Significant progress in hydrogen combustion engines and fuel cells is making transportation by hydrogen a reality. The goal of the Nuclear Hydrogen Initiative is to demonstrate the economic, commercial-scale production of hydrogen using nuclear energy. If successful, this research could lead to a large-scale, emission-free domestic hydrogen production capability to fuel a future hydrogen economy.

The Nuclear Hydrogen Initiative will focus primarily on hydrogen production technologies that utilize high-temperature nuclear reactors to produce hydrogen, which then could supplant fossil fuels in our transportation system. With funding of $9 million in FY 2005, the Nuclear Hydrogen Initiative will move toward dem-

onstrating nuclear-based hydrogen producing technologies in the laboratory, study potential hydrogen production schemes, and develop deployment alternatives to meet growing hydrogen demand.

As previously noted, the Generation IV program priority is on the Next Generation Nuclear Plant, which utilizes a Very-High-Temperature Reactor for advanced hydrogen production and electricity generation. Investigating and demonstrating the Generation IV nuclear energy systems will require advances in materials and systems technology, including development of high temperature and corrosion-resistant materials, and advanced chemical systems analysis. NE is working in close cooperation with the Department's Office of Science, through the Future Energy Advanced Materials Initiative, to evaluate common areas of research to develop advanced materials for use in nuclear hydrogen systems, as well as Generation IV Nuclear Energy Systems.

Advanced Fuel Cycle Initiative

Of all the challenges affecting the expansion of nuclear energy in the U.S. and worldwide, none is more important or more difficult than dealing effectively with spent nuclear fuel. After a long and difficult process, the country is moving forward with licensing a geologic repository for spent nuclear fuel. This is an absolute necessity, even as the Department develops advanced forms of spent nuclear fuel treatment. The Department plans to submit a license application for the repository to the Nuclear Regulatory Commission by the end of 2004.

Research on improving ways to treat and utilize materials from spent nuclear fuel will allow the Department to optimize the first repository, and delay—and perhaps even eliminate—the need for future repositories. The Advanced Fuel Cycle Initiative, with an investment of $46 million for FY 2005, will continue the progress made in the development of proliferation-resistant treatment and transmutation technologies that can reduce both the volume and toxicity of spent nuclear fuel. These technologies would support both national security and energy independence by reducing inventories of commercially-generated plutonium while recovering residual energy value from spent nuclear fuel.

The Department is proposing a research program leading to a demonstration of proliferation-resistant fuel treatment technology to reduce the volume of high-level waste, and development of advanced fuels that could allow the consumption of plutonium using existing light water reactors, or advanced gas reactors. Under the President's request, the Department will continue work toward demonstration of proliferation-resistant fuel treatment technology and continue design and testing of transmutation fuels for future use with current reactor technologies.

For the Advanced Fuel Cycle Initiative to be successful, advanced fuel treatment and transmutation research and development must be integrated with the development of Generation IV nuclear energy systems, particularly with those reactor technologies that can produce very high neutron levels that would be needed to transmute a wide variety of toxic radioactive species. To support this goal, the Advanced Fuel Cycle Initiative will develop the advanced proliferation resistant fuels and fuel cycle systems for Generation IV reactors.

Nuclear Power 2010

The President's budget supports continuation of Nuclear Power 2010 in FY 2005 to demonstrate, in cost-shared cooperation with industry, key regulatory processes associated with licensing new nuclear plants in the U.S. The requested funds of $10 million would support the activities associated with achieving NRC approval of early site permits and development of Combined Construction and Operating License applications.

University Reactor Infrastructure and Education Initiative

For years, the Energy Department has sponsored an initiative that supports nuclear science and technology educational infrastructure through our University Reactor Infrastructure and Education Initiative. This program is essential to the continued operation of the Nation's university research and training reactors, which play a vital role in supporting nuclear education and training.

The growth of nuclear energy in the United States is dependent on the preservation of the education and training infrastructure at universities. Research conducted using these reactors is critical to many national priorities. Currently there are 27 operating university research reactors at 26 campuses in 20 states. These reactors are providing support for research in such diverse areas as medical isotopes, human health, life sciences, environmental protection, advanced materials, lasers, energy conversion and food irradiation.

Beyond technology and equipment, the DOE's university program supports the personnel required for a strong nuclear energy future. The demand for trained and

qualified nuclear scientists currently exceeds supply. The President's budget includes $21 million for fellowships, scholarships, nuclear engineering research, and for critical support to university research reactors—all of which will help address this shortage of well-trained nuclear scientists.

Closing

Mr. Chairman, I believe the Department's FY 2005 budget submission meets the Nation's critical needs for energy, environmental and national security at a difficult time in our history. The Department of Energy, which Secretary Abraham has said might well be called the Department of Energy and Science, hopes to join the Members of the Committee in working to strengthen American science and technology.

BIOGRAPHY FOR RAYMOND L. ORBACH

Dr. Raymond L. Orbach was sworn in as the 14th Director of the Office of Science at the Department of Energy (DOE) on March 14, 2002. As Director of the Office of Science (SC), Dr. Orbach manages an organization that is the third largest federal sponsor of basic research in the United States and is viewed as one of the premier science organizations in the world. The SC fiscal year 2002 budget of $3.3 billion funds programs in high energy and nuclear physics, basic energy sciences, magnetic fusion energy, biological and environmental research, and computational science. SC, formerly the Office of Energy Research, also provides management oversight of the Chicago and Oak Ridge Operations Offices, the Berkeley and Stanford Site Offices, and the ten DOE non-weapons laboratories.

Prior to his appointment, Dr. Orbach served as Chancellor of the University of California (UC), Riverside from April 1992 through March 2002; he now holds the title Chancellor Emeritus. During his tenure as Chancellor, UC–Riverside grew from the smallest to one of the most rapidly growing campuses in the UC system. Enrollment increased from 8,805 to more than 14,400 students with corresponding growth in faculty and new teaching, research, and office facilities.

In addition to his administrative duties at UC–Riverside, Dr. Orbach maintained a strong commitment to teaching. He sustained an active research program; worked with postdoctoral, graduate, and undergraduate students in his laboratory; and taught the freshman physics course each winter quarter. As Distinguished Professor of Physics, Dr. Orbach set the highest standards for academic excellence. From his arrival, UC–Riverside scholars led the Nation for seven consecutive years in the number of fellows elected to the prestigious American Association for the Advancement of Science (AAAS).

Dr. Orbach began his academic career as a postdoctoral fellow at Oxford University in 1960 and became an assistant professor of applied physics at Harvard University in 1961. He joined the faculty of the University of California, Los Angeles (UCLA) two years later as an associate professor, and became a full professor in 1966. From 1982 to 1992, he served as the Provost of the College of Letters and Science at UCLA.

Dr. Orbach's research in theoretical and experimental physics has resulted in the publication of more than 240 scientific articles. He has received numerous honors as a scholar including two Alfred P. Sloan Foundation Fellowships, a National Science Foundation Senior Postdoctoral Fellowship, a John Simon Guggenheim Memorial Foundation Fellowship, the Joliot Curie Professorship at the Ecole Superieure de Physique et Chimie Industrielle de la Ville de Paris, the Lorentz Professorship at the University of Leiden in the Netherlands, and the 1991–1992 Andrew Lawson Memorial Lecturer at UC–Riverside. He is a fellow of the American Physical Society and the AAAS.

Dr. Orbach has also held numerous visiting professorships at universities around the world. These include the Catholic University of Leuven in Belgium, Tel Aviv University, and the Imperial College of Science and Technology in London. He also serves as a member of 20 scientific, professional, or civic boards.

Dr. Orbach received his Bachelor of Science degree in Physics from the California Institute of Technology in 1956. He received his Ph.D. degree in Physics from the University of California, Berkeley, in 1960 and was elected to Phi Beta Kappa.

Dr. Orbach was born in Los Angeles, California. He is married to Eva S. Orbach. They have three children and seven grandchildren.

DISCUSSION

Chairman BOEHLERT. Thank you very much. And thank all of you, proving, once again, what valuable resources we have for this committee.

Let me lead from the heart, if I may, and this is a question for Dr. Colwell and Dr. Marburger. I am baffled as well as disturbed by the proposal to move the Math and Science Partnerships to the Department of Education. At the NSF the program is peer-reviewed, a competitive effort at an agency known for peer-review. The Administration is proposing legislation, which I think is unlikely to pass, to force the Department of Education to peer-review the program. Why does it make sense to move the program to an agency which has procedures the Administration itself opposes?

And while you are thinking about the best way to finesse an answer, let me enter into the record at this juncture a letter jointly signed by the Presidents of the American Council on Education, the Association of American Universities, and the National Association of State Universities and Land-Grant Colleges, which says in part, "Transferring the MSP program entirely to the Department of Education will fundamentally change the manner in which funds are distributed. An MSP program at the Department of Education is primarily a block grant program where funds are distributed to states on a formula basis. This would be a significant disincentive for the best researchers at our universities to continue to participate in this important program." And we want the best researchers at our universities to have incentives, not disincentives. I mean, that is part of the heart and soul and promise of the program. *[See Appendix 2 for the information referred to.]*

So Dr. Marburger, I will let you lead off.

Dr. MARBURGER. Well, I will make a general statement and let my colleague, Dr. Colwell, make more specific statements.

The Department of Education itself is assuming a greater responsibility for research and implementation of programs that integrate the educational resources of the Nation. And that is reflected in the budget proposals and in the changes that are requested for permitting the Department of Education to make competitive grants larger than a certain amount. The role of research within the Department of Education has been strengthened. Mr. Chairman, yet another New Yorker is heading up that effort, and I believe that the Department of Education is capable of mounting an excellent program——

Chairman BOEHLERT. Nice finesse, but if it ain't broke, don't fix it.

Dr. Colwell.

Dr. COLWELL. Well, the Math and Science Partnership is clearly a Presidential priority. The Administration decided to change the focus of the program, moving in a direction away from academic institutions working in partnership with local school districts and away from education and research testbeds.

Chairman BOEHLERT. Is that the right direction?

Dr. COLWELL. I have always——

Chairman BOEHLERT. Well——

Dr. COLWELL [continuing]. Been moving toward a model that consolidates the school—control in the school districts.

Chairman BOEHLERT. Nice attempt. Thank you very much.

Let me go to the next question. But I hope you understand where we are coming from, at least where the Chair is, and I think a vast majority of this committee: we are simply not doing well enough in math and science education K through 12, and if we don't do better, shame on us. Our preeminent position in the global marketplace is going to be lost. And I had a meeting last night with some of the Presidents of some of our leading companies: Hewlett Packard, Dell, etc., etc. This is a major concern that they have. It is a crisis when our kids, in the math and science disciplines, are compared with their counterparts around the world and score 16 or 17 on the list. That is not good enough. And so this is one where we are going to do battle, if you all try to just be good soldiers.

Let me go to the next question for Dr. Colwell and Dr. Orbach. And I am not—Chuck and Phil, I am not ignoring you, but you did quite well on the budget. I would like each of you to tell me, with some specificity, what you would spend money on if you had received a five percent or a ten percent increase in the Administration's budget rather than the figure you have got. Dr. Colwell.

Dr. COLWELL. Well, very clearly, grant size and duration is very, very important. And we have focused on management excellence, making more efficient and more effective the workings of our scientists and engineers and providing them with the tools that they need to do good science. So very clearly, increasing grant size and duration is a very, very important objective.

Dr. ORBACH. We believe that we have made the correct priority decisions within the Office of Science. We would like to suggest that areas that would help the research community explicitly, namely university support, to use the facilities that we currently have would be an excellent choice.

Chairman BOEHLERT. Thank you very much.

This committee was very proud when the President, with a good deal of fanfare, signed legislation that came from this committee to put the National Science Foundation on the path to double its budget in five years. We are still wedded to that concept, and we think it makes a great deal of sense for the American economy. And Dr. Orbach, we have a great deal of interest in what you are doing. It is very important work, and you need resources to do it. And once again, I am not advocating that we just spend willy-nilly and add to the deficit. Every Committee Chairman says, "Don't touch my turf; just increase it and worry about everything else." In the overall budget numbers, I can find wiggle room, and the wiggle room would be in your favor.

Thank you very much.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

And first, let me concur with everything that you said, particularly in the science and education——

Chairman BOEHLERT. Let the record denote that.

Mr. GORDON. I think we will do that frequently, but particularly in the area of science and education. I hope this is something that we can get behind us quickly.

And Dr. Marburger, I recognize you are the messenger, and that you are doing the best that you can with what you have to bring us, so don't—you know, I am not here to criticize you in any way. And I agree with you that we did make good strides—or I am pleased with the increases in the nanotechnology. I think that is going to be a high priority, and it should be.

But I simply can't agree with you on your statement that we are maintaining our world leadership. As I look at this budget—in the Administration's own budget, on page 61, as I look through here, I see NASA, the Earth Science's S&T is down eight percent. Aeronautics Technology, a cut of 11 percent. Energy research is cut by two percent. The energy conservation is cut by a full ten percent. Even Defense, in the S&T area, is cut by 11 percent. Basic research, four percent. Applied research, 13 percent. Agriculture is cut in S&T by nine percent. Interior, two percent. Veteran's affairs research, six percent. Environmental Protection Agency, 12 percent. Transportation, four percent.

And Mr. Bond, I was really excited about your statistics, and I couldn't—I was trying to, you know, get these equated with the book. Fortunately, my Legislative Assistant here is smarter than I am, and she explained to me the problem and that is you are basing your increases on what the President had requested the previous year. But Congress had increased all of those. And so yes, you are getting an increase on—the President is increasing his request, but not in terms of what you are actually getting. I mean, as I see it, the Commerce Department, just in R&D itself, is taking a—you know, that is a five percent cut. And then if you look over at your S&T budget on page 61, the whole S&T Commerce is getting a 14 percent cut. NOAA is getting cut 11 percent. The Advanced Technology Program is getting cut by, as you know, 100 percent. So it is—as they talk about statistics, but you did a good job. Fortunately, we have someone here that is, as I say, smarter than I am to understand this.

And I know you have no vendetta against the manufacturing community. You want to see us prosper and do well. And I am sure that with the assets you are giving, you are going to do, you know, the best job that you can. And I think it will be a good job.

We talked the other day about the Manufacturing Extension Programs. And as a quick review, as you know, the Administration requested it be done away with completely two years ago as well as the ATP, although they did leave $12 million in for—from, I think, $106 million to $12 million to close it out. Congress, in a bipartisan way, put $36 million back in. This year, you are asking for that to be, you know, at least maintained at that area. And as you know, this is a program where our dollars, our federal dollars, then get matching dollars from state and then another match from the revenue. So it is a one—you know, it is $1 generating $3.

And so I am just trying to get a hold of these priorities here. In 2002, they did a survey of $\frac{1}{3}$ of the MEP clients. And they found that the program had resulted in increased and retained sales of $2.8 billion, achieved cost savings of $681 million, led to the investment of $940 million, and created 35 million jobs. Now with that track record—and that was conservative, that was just $\frac{1}{3}$. Now they may have taken the best $\frac{1}{3}$, I don't know, you know, but there was

still more to go. With that kind of track record and with the match you are getting, where should we better be putting money? I mean, what programs do you have that are better than this?

Mr. BOND. Well, I would say that, in this case, the Administration has arrived at the conclusion that they want to support the MEP program going forward. And as you noted, that compares favorably with prior years. What we want to do is try to make sure that we are leveraging it and being as smart as we possibly can with, admittedly, a very tough legislative environment. There is—I am not going to say anything but good things about the MEP program and its effectiveness. This is a reflection of very difficult budgetary times.

Mr. GORDON. Well, states are telling me that they are going to have to start closing things down. I mean, are you hearing the same situation?

Mr. BOND. The centers and their various partners at universities and states and so forth are certainly aware, first and foremost, I think, of the 2004 action and trying to figure out what that means for the remainder of this fiscal year. And we are talking to them. We do want to try to keep the network alive. We want to make it useful to manufacturers. We are going to look at ways to leverage other resources, both within the Commerce Department, but across the federal enterprise, because as the Secretary's report made clear, the challenge to manufacturers is multifaceted. As I know that you said in our meeting the other day, it is not as if fully funding MEP solves the manufacturing issue in America. There are intellectual property issues that Chairman Smith deals with over in the Judiciary Committee. There is tax policy, and many others.

So we are going to try to look at all of these. In the case of MEP, we are going to try to take advantage of technology to minimize back office expenses. Maybe coordinate on a regional basis, get on a common platform for sharing information and data, which doesn't exist currently, and then we are going to try to maximize the feet on the street by making sure we work smartly with our partners at ITA, but also looking at other bureaus of Commerce, looking at the Department of Homeland Security, the Department of Defense, the Department of Labor and their 21st century jobs act effort wants to go to community colleges. 138 community colleges are part of MEP.

Mr. GORDON. I have been told that my time is over; that means your time is over.

Chairman BOEHLERT. But our time up here isn't, and this is a program we have an affection for.

Thank you very much.

In keeping with Committee tradition, first come, first served. Next up, Ms. Biggert.

Ms. BIGGERT. Thank you, Mr. Chairman. And if I might, for the record, associate myself with your remarks about the math and science. I truly believe that if this goes over to the Department of Education that all of the good work that has been done will be lost. And I would hope that there would be more talk about what really has happened and what has been done at NSF, too, and the good that has been done from this program. I go out and talk to young women, and I know that they hold you up. And I use you as an

example as a role model for young women to go into the profession. And so I thank you, Dr. Colwell, for all you have done. And I hope that that program remains.

And ordinarily at this time, I would talk about my strong support for scientific research at the DOE and my disappointment in the fiscal year 2005 budget for the DOE Office of Science, the Nation's primary supporter of research in the physical sciences, which has been essentially flat-funded for the past decade. But today, I want to take the opportunity to ask some questions of Dr. McQueary about science and technology at the Department of Homeland Security. One of the responsibilities that I take very seriously, as Chairman of the Energy Subcommittee is my responsibility to oversee and be a steward of all of the Department of Energy's National Laboratories. And that is why I have to express some strong skepticism and concern about the Department of Homeland Security's December 16 decision on what various roles different National Laboratories will be playing in the Homeland Security research.

I really believe that the labs work best when they are allowed to work together, so that they can collaborate and do the research that they do best. The structure established by the Department to involve the labs in the Homeland Security research basically puts a wedge, I think, or a firewall between the National Laboratories, creating two classes of laboratories, undermining their ability to collaborate and essentially setting these two groups up to work against each other. And if there is going to be a firewall, wouldn't it be better between the—that it be between the labs and the private sector rather than DOE's various National Laboratories? So namely, I am concerned about the lack of transparency by which DHS decided which labs were to be intramural and which were to be extramural, and the criteria to make such a determination really lacked transparency. And assuming this criteria was actually used to make, rather than simply after the fact justify the decision, then I would think that the Department would have no problem in sharing with me this information. And I would ask if you could submit that criteria to me in writing as well as something about the different labs and, you know, how they stacked up against each other.

Dr. MCQUEARY. Sure, we would be happy to do that. This has been a remarkable experience for me, personally, because when we sat in the room deciding how to approach this, what we truly believed we were doing was providing the maximum opportunity for the labs to be a participant in what we are doing, and yet this somehow has been turned into a view that somehow we are trying to exclude labs, which is nothing further from what the factual truth was. So I would be more than happy to share with you what the criteria had been. I would be happy to have an independent group come in and review our approach to doing this, because, I can assure you, nothing that we ever talked about or any discussion that we ever had went along the lines of the view that has been developed about what our intentions were. It is a complete polarization of what we were really trying to do.

We are in a situation where it is very important that we have the support from the labs, and of course, the Homeland Security

Act not only provided us the opportunity to do that, we are greatly appreciative for that, because we could not do the work we have to do without it. It also had given us the opportunity to work with the labs that we deemed most appropriate for our mission that we have. And so our choices were really based upon looking at the mission responsibilities we have in the chemical, biological, radiological, and nuclear areas. So yes, I will be happy to do what you would like from us.

Ms. BIGGERT. If that independent group recommended a different approach to the intramural external—or extramural designations, would your Department adopt that recommendation?

Dr. MCQUEARY. I would like to look at the criteria that they would use to come up with a different conclusion, but certainly we would listen very attentively to it, which is part of the responsibility that we have.

Ms. BIGGERT. One other problem, and I did talk to one of the senior members of your staff——

Dr. MCQUEARY. Yes.

Ms. BIGGERT [continuing]. About this, that I couldn't—that I had trouble understanding is that you talk about a mission-directed applied research for what the Department will be looking at, and specifically not basic research. Isn't the support for today's basic research essential to ensure that tomorrow's technology—to ensure the technological advances? So if it is not your agency who supports the basic research, how do you propose to take advantage of the pipeline from basic research to fulfill your mission?

Dr. MCQUEARY. You are touching on something that is very important, and I think it relates directly to where we are in the formation and execution of the responsibilities of the Department. Were we much farther into this process, I think we would see a greater emphasis on basic research, but when I came into this position, very early on, I thought that the responsibly that I was going to have was to set what the fundamental research direction had to be. What we have actually found is that there is an enormous amount of technological capability, not only in the labs, but in private industry and universities, that is available, essentially, now to be brought to bear to work with the Department.

Ms. BIGGERT. But it seems in your structure that you set up some of the labs to be in competition with industry, and yet there has always been the criteria, or at least in most of the—when the labs are doing research, that they will do it unless the industry can do it. If the industry is not capable of doing it, then the labs step in. So there really has been this criteria not to compete with industry. How is that going to change?

Dr. MCQUEARY. Well, I don't believe we set up a situation where we——

Chairman BOEHLERT. Well, respond to that, and that will be—your time is expired, but this is an important question, so——

Dr. MCQUEARY. We did not intentionally set up something where the labs were competing with industry, in fact, quite the opposite. We think it is absolutely essential that we have the participation not only of the labs, because there are scientific areas in which only the labs have the expertise and capabilities that this country needs in order to excel in this mission that we have in Homeland Secu-

rity. What we have tried to do with the selection of the labs as we did was provide the opportunity, actually, for some of the labs to work and compete with private industry in some of the—and particularly in the Homeland Security Advanced Research Project Agency. So we did not try to set up any kind of a competition whatsoever, and I don't believe that we have in the approach that we have taken. It is a——

Ms. BIGGERT. Thank you for your indulgence, Mr. Chairman.

Dr. MCQUEARY. Thank you for the questions, important ones.

Chairman BOEHLERT. Mr. Udall.

Mr. UDALL. Thank you, Mr. Chairman. I want to also welcome the panel. And if I might, I am going to direct some questions to Secretary Bond, but I just want to make a couple of quick comments.

I think we are known as a gentle Committee here or rational Committee. We take our cue from the scientists who advise us. But I know that the remarks of the Chairman and the Ranking Member represent many of the sentiments that we share. And R&D is a cause for all of us, and we, for many important reasons, understand the role that R&D and these investments make in our economic competitiveness, our very quality of life, our standing in the world. And I think it is clear, also, that you all are messengers, and that you have been asked to deliver some tough news to all of us. But you are also messengers going back the other way. And I feel a little bit like the situation here at the Science Committee is akin to the fact that you have got librarians that are concerned about the Patriot Act, and those radical librarians, you have got a lot of the rational Members of the Science Committee who are very, very concerned about where we are heading with this budget that is in front of us. And I think you are going to hear more about it, but I am asking you to deliver the message back to the people with whom you work that we have some grave concerns, and we are going to work hard on this committee to see that these budgets are boosted up and that we make the kind of investments that are going to pay off in the long-term.

With that, Secretary Bond, great to see you. Thank you for your kind words about NIST and the work we are doing together. I looked somewhat like Congressman Gordon has at some of the numbers, and when I look at the NIST lab funding and I start to add up the numbers, we got $85 million added in 2005, but if you look at the facts, there is probably only $11 million really for new initiatives out of that $85 million. I want to run my math by you and get you to comment. We have $26 million you have got to transfer for AML minus $35 million for the ATP close-out that is not included here. From what I understand, we zero out ATP, but we have got $35 million we have to use in the close-out. Plus, we have transferred a certain percentage in the past of ATP funds to the lab, $13 million, give or take. So if you add all of those numbers up, out of that $85 million that are in the budget that is a plus, that leaves, really, only $11 million. So how are we going to fund these new initiatives that, in my math, total about $58 million to $60 million?

Mr. BOND. Well, you are putting your finger, in particular, on the ATP issue, and we are going to have to try to work through the

implications of that and look forward to working with the Committee on that. It is a very difficult implication of both the intramural and buyout proposals, in terms of buyouts of existing mortgages within that program. Of course, those have always been on a funds-available basis. But that is a real challenge. And what our message is, our focus is, the core work of the labs along with the really pressing construction and facility needs out of Boulder in particular and that that needs to be our focal point going forward.

And so the impacts and implications of some of these other numbers, we are going to have to work through, and I am going to have to, in conjunction with folks out at NIST, work better and smarter at finding other clients, both in the private sector, for instance through AML, and in the public sector, who use the metrology and great science that is going on at NIST in completing their missions and attract more other agency funding.

Mr. UDALL. So you are acknowledging, then, in fact, some of the numbers I have shared with you make some sense, and when you begin to add those up that you have got some inner line item transfers and that that $85 million is not what it appears to be when you first take a look at it?

Mr. BOND. Well, the $85 million that you are citing is a comparison, I believe, with the 2004 appropriation rather than the 2004 request. But there are implications to some of these things, and I would be happy to sit down and parse through all of the numbers with you in excruciating detail, but the challenge is clear in the implications.

Mr. UDALL. Let me move in my remaining time to MEP. I think you know my support for MEP. We have some great success stories in my District. And again, Congressman Gordon, I think, asked a fundamental question. What a great return on investment we have had with that program, and what is it going to take to make the further investments in the future? But if we move in the direction that the budget suggests, we are going to work more with the states. And have we contacted—have you been in contact with the states to generate some ideas as to how this new approach would unfold? I have a whole slew of questions. I don't have enough time to ask all of them of you——

Mr. BOND. Yes.

Mr. UDALL [continuing]. But how are we going to portion the funding? Are the states going to be equal partners or are they just going to be pass-throughs? How are we going to work this new MEP approach out? Can you respond?

Mr. BOND. Yeah, very quickly. We do envision a recompetition in July, as was outlined in the Secretary's report. And the centers already are talking among themselves about how to coordinate on a regional basis. There may be Centers of Excellence that emerge out of that where more than one center would go together to form a Center of Excellence. So there is going to have to be some creative thinking going forward. And from our side, we are going to look at how to combine them with the U.S. Export Assistance Centers deployed all around the country, perhaps even the Agriculture Extension Service offices around the country, to leverage federal expenditures, wherever they are, to try to help manufacturers both globalize their markets and upgrade their technology.

Mr. UDALL. Again, I want to thank you for sharing your point of view with us, and I look forward to some spirited discussions and your good work on behalf of NIST. Thank you.

Mr. BOND. Thank you.

Chairman BOEHLERT. Thank you very much. The Chair yields five minutes to Mr. Smith.

Mr. SMITH. Mr. Chairman, thank you.

And Dr. Colwell, in my years as Chairman of the Research Subcommittee, I have really appreciated working with you to keep NSF as one of our gems. And Dr. Bement, Arden, look forward to you taking the baton and running the next 440 lap to make sure that we not only continue that gem but maybe improve it.

Mr. Chairman, first, I would like to express my serious concern, as you did, about the Administration's suggestion of moving the Math and Science Partnership out of the National Science Foundation over to Education. And I would like to move that a letter from one of my constituents, Hyman Bass, who is the immediate past President of the American Mathematical Society. He is now President of the International Commission on Mathematics Instruction. If I could enter his letter into the record expressing his deep concern about the movement of that facility. *[See Appendix 2 for the information referred to.]*

Chairman BOEHLERT. Without objection, so ordered.

Mr. SMITH. And I think I would like to just follow that up with a question to you, Dr. Colwell, in terms of has the National Science Foundation been doing a good job, and what have you been doing, just briefly, to try to implement this program? I have the pen that the President signed the legislation with just 14 months ago with a lot of accolades on the potential success for having a research community move into the kind of research that is going to make more evident what is successful and not successful. What has NSF done in the past year and what have you done successfully?

Dr. COLWELL. I think the most important aspect of the success is bridging the higher education community with the K–12 community and with the community itself, the citizenry of the community, including industry. I think that triumvirate is extremely important in building the kind of strong background support that you need for maintaining a really good K–12 education. And we have introduced into the program learning capabilities, hands-on science and math education in the programs. It has enabled, as well, integration with the other disciplines of the National Science Foundation.

Mr. SMITH. If the program is transferred to another department, and I hope it will not be, how are the programs that you have initiated going to—are they going to continue——

Dr. COLWELL. Oh, yes. They——

Mr. SMITH [continuing]. With the oversight of NSF or will that oversight be transferred?

Dr. COLWELL. No, they will continue—the ones that have been initiated will continue with NSF oversight, and our programmatic thrust will definitely continue.

Mr. SMITH. I want to, I think, preface a lot of people are here listening to what is going on in this hearing, because there are a lot of people interested in the science and research that we do. It is important to our future, but let me say we are in a predicament

now. We just spent two hours in our Republican conference expressing concern over the $540 billion deficit that we are amassing this year. And so I would suggest, respectfully, that that means there is a responsibility to everybody in this audience, certainly the Administration, to look for ways that we can improve the efficiency of our research programs. Research is vital to our economic future. However, we have now seen that our basic research is sometimes picked up and implemented or applied by other countries. We have got to look for ways, and you are the people that can help guide us, on how do we make it a win-win situation for business and industry to be more involved in research in general, to be more involved in basic research as we look at how we are going to write the tax credit for the future, as we look at how we can adjust property rights to make sure that our basic research is mostly implemented to the advantage of our economy and the jobs in the United States, and not simply give into other countries who are now spending their federal dollars in application.

Let me also get a quick response, maybe, in terms of what we are going to do in terms of the problems of the giant increase in major research facilities. I think there is almost a 30 percent research increase in large, big facilities. This means, to me, that there is an obligation in the future that there is going to be an increased financial effort to keep these large research projects going. With a 30 percent increase now, and I am going to start with you, Dr. Marburger, what are we going to do? Does this mean that we are going to expect budgets in future years after 2005 to continue the implementation of these large research projects? Is that going to eat up more of our basic research budget?

Dr. MARBURGER. Congressman, that issue is very important to us, and it requires planning and wise marshaling of resources at the present time. All of the agencies, all of the large science agencies that have these types of facilities are doing planning. I would point to the facilities plan that was recently released by the Department of Energy——

Mr. SMITH. Specifically, does this mean the 2006, the 2007, the 2008 budgets are going to have to have a larger dedication to the financing, the continuation, the utilization of this large research increase effort?

Dr. MARBURGER. Our expectation is that facilities will be built in the expected envelope for funding. Reasonable projections have been made. I know that in the Department of Energy Office of Science facilities plan they worked closely with the Office of Management and Budget to craft a funding framework that could accommodate the operation as well as the construction of these facilities. And we look for that. We continue to try to make sure that these facilities can be operated in the long run. OSTP has a National Science and Technology Council Committee that is cochaired, I believe, by NSF and NIH or—I am sorry. I can't recall.

Dr. COLWELL. The Committee on Science——

Mr. SMITH. I am just saying, Mr. Chairman, it is an obligation for the future for this subject. It is a problem that needs to be looked at very carefully.

Chairman BOEHLERT. Yeah, and I would point out that Dr. Orbach's report assumes some things that I am not sure we are in a position to assume: increases of about ten percent a year.

Dr. ORBACH. The outlook itself did not assume that; it said that these were the priorities of the Office of Science and were the budget to increase, this is how the money would be spent.

Dr. COLWELL. May I comment, Mr. Chairman?

Chairman BOEHLERT. Dr. Colwell.

The gentleman's time has expired, but your comments are always welcome.

Dr. COLWELL. Thank you.

I think it is important to look at it from another perspective. That is very critical. We have very carefully prioritized, but the projects keep us at the leading edge of science. And they—but these are tools which are used to educate the next generation, and these are tools that allow our scientists to remain at the forefront of discovery. So I think the careful selection of the projects that lead us in physics, in biosciences, environmental sciences, oceanography, these have to—the investments have to be made, but, as Dr. Marburger said, we have to make sure that they are very carefully—budgets are very carefully constructed to get done what we need to get done without excess.

Mr. SMITH. May I speak? So the starting with the obligation for the future is what I think needs to be examined.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you very much, Mr. Smith.

Mr. Lampson.

Mr. LAMPSON. Thank you, Mr. Chairman.

First, I want to associate myself with the words of Nick Smith about Dr. Colwell and the work that you have done. It has been impressive knowing you and working with you and on that wonderful trip that we had a little over a year ago I learned a great deal from you, that impressive work, I want to congratulate you for it.

And then I want to associate my words with Congressman Udall when he commented about all of our concerns about what this budget looks like. And I—probably rudely, but I will say it anyway, it made me wonder a little bit why some of you who believe so strongly on some of these things can sit there and tell us some of what you say about the budget and what we—and what I know you and many of the people in this room and across this country who are watching this would truly like to see. We need the help when we can get it, and you are the leaders in that area that can put into our minds what we can do to help this whole process of growing the knowledge that we have in this country.

Let me ask—try to get three questions in, and the first one is on the off-shoring of jobs, and this is of Dr. Marburger. There was an article in the *Los Angeles Times* that came out, I think yesterday, "Bush Supports Shift of Jobs Overseas." There is a growing concern about jobs moving overseas, and increasingly it is the high-tech jobs, like radiologists and software developers that seem to be moving. One comment that Gregory Mankiw, the Chairman of the Administration's Council on Economic Advisors, made the comment that maybe we will outsource some radiologists. And what does that mean? Well, maybe the next generation of doctors will train

fewer radiologists and we will train more general practitioners and surgeons. Maybe we don't have a real comparative advantage in radiology. My brother, who is a radiologist, doesn't agree with that and is very concerned about what might be the future of his own profession in this country. What is the Administration's philosophy about off-shoring of high-tech jobs? Is it a problem or is it a valuable byproduct of free trade, as the President's Chief Economist suggested recently? And what are the implications of off-shoring high-tech jobs on the future need for scientists and engineers within this country? Dr. Marburger.

Dr. MARBURGER. The answer to the question of off-shoring is really to make sure that we have a strong innovation infrastructure in the U.S. so that we continue to create high value added jobs. Wherever the frontier is in technology, we have to be on that frontier, because inevitably, as technology increases the global economies throughout the world, we are going to have more and more people who are capable of doing more and more sophisticated work, and those jobs will be shared. The only way we can stay ahead is to make the basic investments that this committee advocates in the infrastructure that permit us to develop innovative technologies and get them into the marketplace. That is the philosophy of this Administration: stay ahead, keep moving, and make those jobs work for all Americans.

Mr. LAMPSON. Well, it remains to be seen, obviously, the jobs that we are soon to be creating are coming in at about 30 percent less income-wise than what those that we seem to be losing from this country.

Let me move on, because I want to get two other points in. Dr. McQueary, in the Environmental Protection Agency budget documents, we find an $8.2 million reduction that represents complete elimination of Homeland Security building decontamination research. We have a little bit of an interest in that around here, because of the anthrax and the ricin that have caused building shutdowns recently. Would you explain the logic behind this decision to eliminate this research? And would you agree that the value of a network to detect the presence of hazardous agents is diminished if we haven't determined the most effective ways to recover from the attacks detected by that network?

Dr. MCQUEARY. I don't have the knowledge to comment upon the EPA reduction that you mentioned. I was not aware of that. I certainly agree with the premise, though, that we must have the knowledge to be able to make the detection and the determination as to what needs to be done. But I can't answer the question. I would be happy to look into it and provide a response back to you.

Mr. LAMPSON. We would appreciate it——

Dr. MCQUEARY. Okay.

Mr. LAMPSON [continuing]. If you would.

And then one last thing that has a significant importance to me. I have been on the Aviation Subcommittee on Transportation. We have the Houston Intercontinental Airport just on the fringe of my District, and I am in that airport every week coming back and forth here. A significant and near-term threat is the use of Man–Portable Air Defense Systems to attack commercial airliners. What actions has the Directorate taken to address this threat? And what

is the current expectation for seeing those defenses employed—deployed, and has the Department given consideration to ground-based defenses against these potential missile attacks?

Dr. MCQUEARY. As you know, we have initiated a program called Counter-MANPADS, and we have selected three contractors to begin six-month studies to begin looking at what needs to be done to transition the military version of aircraft protection into a commercial application. If you have talked to commercial pilots, people in the commercial airlines industry, it is not just a simple issue of translating what the military is already doing——

Mr. LAMPSON. Right.

Dr. MCQUEARY [continuing]. And putting it on commercial aircrafts. There are a lot of issues that have to be dealt with. And we believe the program that we have undertaken to get to an answer that the Congress and the President can consider at the end of about a two-year period of time, to make the determination as to whether putting Counter-MANPADS on the aircraft is an appropriate thing to do or not, is a very aggressive program, but one that we believe that we can execute on.

Mr. LAMPSON. We are most anxious to hear more of that.

And Mr. Chairman, thank you for your time, and forgive me——

Chairman BOEHLERT. Thank you very much.

Mr. LAMPSON [continuing]. I must go to another hearing.

Chairman BOEHLERT. Thank you.

Mr. LAMPSON. Thank you.

Chairman BOEHLERT. Dr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman. Before I get into my main questions, I just want to add my voice to the chorus, condemning the proposal to move the NSF Math and Science Program to the Department of Education.

Chairman BOEHLERT. All opposed, say no. Aye. The nos have it.

Mr. EHLERS. It obviously is dead on arrival, but I just can't understand where this came from. I mean, the most polite comment I can make is that it is strange. A little more accurate would be that it is absurd. And if I told you what I really thought of it, you would rule me out of order.

This is a program that we established in law. It is a Math and Science Program put in an agency that has 30 or 40 years of experience in doing peer-reviewed grants for this type of program. In fact, I was a recipient of two of those many years ago in my teaching career. And it is being moved to a department, which doesn't have that experience. It is stripped out of science, makes it simply math for high school students and for students who are at higher risk, and it totally defeats the original purpose. While at the same time, in the math—in the No Child Left Behind Act, we did provide for a Math and Science Partnership program there. We authorized it at $450 million a year, and the Administration has rarely requested anywhere near the amount, and the amount we have in it is due entirely to my efforts in lobbying the appropriators here. So it just—it is a no-starter, and we might as well kill it immediately and let everyone know it is killed.

I will—Dr. Marburger and Mr. Bond, shifting gears, I would like to discuss a current budget year problem, even though this is a hearing on next year's. And we appreciate some of the changes

being advocated for NIST for next year, but the current year, they are on the rocks, literally. And I am not blaming you for that; the Congress deserves as much, or more, blame for that than you do. But what are you going to do to get NIST through this fiscal year? And there are several programs that have to be done. The Voting Committee, establishing standards for voting machines, is not going to be finished until after we have spent the $2.5 billion for voting machines. That makes absolutely no sense. And we need the money for that right now. In fact, we needed it months ago. You have other budgetary problems there. What ideas do you have for getting them through this current fiscal year, and especially if we, for some reason, can not get agreement on the appropriations and have a continuing resolution, you are in even worse trouble? I would appreciate comments from both of you.

Dr. MARBURGER. This is an operational problem. As the Department of Commerce discovers ideas, my office will certainly help to implement them in whatever way we can. There is no question that the bill that was passed appropriating funds for NIST creates big problems. And Congress may need to help.

Mr. BOND. Mr. Ehlers, if I could, let me start by thanking you for your non-stop support for NIST. But let me say that there are going to be some real difficulties in probable dislocations. We are going to have to look at not only early retirement options where that might work, but possible rifts. That is a reality that we are looking at. And we are going to try to exhaust every opportunity that we can to keep the scientists on board, as much as possible.

In terms of the HAVA, the Help America Vote Act, I do want you to know that we are committed to trying to find a solution that—I have had our attorneys looking at different options to see what we might work out with states and the EAC and others involved to see—it is very much a chicken-egg problem. They don't want to move ahead until they have the standards guidelines from NIST, but we don't have the funding to do that. So we need to solve that, and we look forward to working with you to do that.

Mr. EHLERS. Well, all of it has to be solved, and you have an agency that has won two Nobel Prizes in a——

Mr. BOND. More coming.

Mr. EHLERS [continuing]. Space of two years. Just announced the discovery of the Fermion condensate, which may or may not be eligible for another Nobel Prize, and you are starving this particular year. And I hope—I think it is going to take action outside of your Department as well to resolve that problem, and I hope, Dr. Marburger, you can help with that.

Let me shift to the R&D budget, which has also been mentioned.

Chairman BOEHLERT. A quick shift, if you will. You have 20 seconds left.

Mr. EHLERS. Oh, well, I can keep going longer than that.

Dr. Marburger, you indicated that the budget response to the recommendations of PCAST, the President's Council of Advisors in Science and Technology, regarding needs in physical science research, and they recommend that science—physical science research be brought into parity with biomedical research and other life science research. This budget doesn't do that. And are you—do you have plans to try to bring that back up? The Congress has ex-

pressed that we want to double the NSF budget. This budget certainly is not going to do that, but there are other physical science areas that are in trouble, such as Dr. Orbach's. Could you comment, please?

Dr. MARBURGER. This budget does give a larger increase for NSF, for example, than for NIH, which is an unusual——

Mr. EHLERS. In dollar amounts or percentages?

Dr. MARBURGER. Well, the NIH budget is really up there, as you know, and so any shifting of emphasis in a budget of this size is going to take more than one year. And I believe that what we should look for in this budget are signs of intent and priorities. And the priorities that receive increases in this budget certainly fall in those areas that we have been getting a lot of recommendations about. And I believe that that is a significant signal. Keep in mind that in many of these areas, there is a fairly large base and that it isn't as if this Administration has been sitting on its hands for four years, that the record of increases in all of the relevant science budgets for physical science is good for this Administration. So I am optimistic that, with time and the assistance of Congress, we will tune up our budget and make sure that it stays current with where the opportunities in science are today.

Mr. EHLERS. May I just quickly comment that the record is good, primarily because the Congress every year has increased the Administration's request, largely due to the efforts of Mr. Boehlert and some others.

Thank you.

Chairman BOEHLERT. Thank you very much. I will give you more time if you are going to speak like that.

For the concluding questioning for this round, we will go to Dr. Gingrey, and then we will have—Mr. Gordon wants to get something on the record, and we hope to have this wrapped up by 1:00, because we are mindful of your schedules and ours.

Dr. Gingrey.

Mr. GINGREY. I thank you, Mr. Chairman.

You know, these are pretty tough economic times, of course, and we are looking at a $520 billion deficit that nobody is happy with, but of course, we have got an ongoing war and Operation Iraqi and Enduring Freedom. We are trying to continue to build a strong national defense and providing a much needed prescription drug benefit, especially for the neediest seniors, recovering from a recent cyclical recession and, of course, the economic devastation of 9/11. So there are a lot of things that have contributed to the situation we find ourselves in this fiscal year, and, as I say, a $520 billion deficit. Now the President is calling for, in this fiscal year 2005, to hold discretionary spending, excluding Homeland Security and the Department of Defense, to no greater than ½ of one percent increase. And of course, there are a lot of programs in there in that discretionary spending, social programs, education, that a lot of Members are going to have a hard time and are going to have a lot of heartburn in holding that spending to a ½ of one percent increase, or possibly even decreasing it.

And so in looking at the Department of Homeland Security, in particular, and I will direct this question to you, Dr. McQueary, in regard to the increased spending that this recommendation has on

R&D, and I think that number comes to almost 15 percent in this particular, and that is on top of almost a 90 percent increase from 2003 to 2004. How can you—how can we justify that level of increased spending, particularly when we have things like the Manufacturing Extension Partnership, which took a tremendous hit, and now the recommendations that we stayed level at that previous 70 percent reduction from last year? That is one question I would like for you to answer.

And the other one is this: in the fiscal year 2004 appropriations report for the Department of Homeland Security, Congress instructed the Department to consolidate all research and development funding within the Science and Technology Directorate in the fiscal year 2005 request, and this has not happened. What Department of Homeland Security Research and Development activities have not been transferred into the Science and Technology Directorate? And are these activities that overlap—are there activities that overlap and could be consolidated down into a single program? Where can we save some funding?

Dr. MCQUEARY. You—well, you asked several questions. I hope I can do justice to all of them. Let me touch upon the last question first. We have a plan that we have put together and, per the direction of the Congress, to have the consolidation for all of the R&D work done within the Science and Technology Directorate this fiscal year, and we will have that done. We have looked at budgets. We have examined where they are. We want to make sure that what we transfer in is primarily—is the R&D, not any of the operational aspects. And so some of the units have both operational responsibilities as well as R&D responsibilities. So how we take that apart and transfer it is really important.

The part that we have not transferred in is—really falls in two areas: one, the Secret Service function, we have very carefully left that alone for the time being, although we do have a Secret Service portfolio so that we believe that we will be increasing the amount of R&D to support them, but it will be managed by S&T. The second area is in the Coast Guard area. As you well know, there is great interest within the Congress. They have a small laboratory in Connecticut that has had a budget of about $22 million, and that organization will remain with the Coast Guard, although we will assume oversight responsibility for work that is done there. So in those two areas, Secret Service and Coast Guard oversight, and all of the others, the R&D work will be transferred in.

In terms of whether we can save any money yet, sir, it is just too early to be able to know. The primary budget increase we had was in the biological area, particularly in the—so we can do better biological surveys within large metropolitan areas. We do have about a doubling of the number of sensors and capability in that area.

And you may have had one other point that I have failed to pick up.

Mr. GINGREY. Well, I think the last point was—and I know we are about running out of time, but I think my last point was just that the overall amount of increase and your feeling in regard to the Department of Homeland Security and a ten percent increase as the President's budget calls for——

Dr. MCQUEARY. Yeah.

Mr. GINGREY [continuing]. When everything else is being, virtually, frozen.

Dr. MCQUEARY. I have not examined my fellow workers here at the table, their budgets, and therefore, I would not, for a moment, attempt to try to comment upon those budgets. I think it would be inappropriate for me to do so, because we are talking in numbers. I think the issues that we have to address are what kinds of things that are being accomplished. And that is really the measurement, not the amount of money that is being spent.

Mr. GINGREY. Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you very much. The gentleman's time is expired.

Mr. Gordon.

[No response.]

Chairman BOEHLERT. Ms. Jackson Lee.

Ms. JACKSON LEE. I thank the distinguished Chairman, Ranking Member, and the panelists. Let me acknowledge and express my appreciation, Dr. Colwell, for your service and energy behind the National Science Foundation. And I am sure that though you are very professional today, there is a sense of glee, no more Congressional Committee hearings. And I won't ask you to applaud for you, and I thank you so very much for your service.

Dr. COLWELL. Well, thank you.

Ms. JACKSON LEE. When I came to this committee some years ago, and those of us who are on the Science Committee believe it is the most important committee this Congress has, and of course it engages us in a vigorous debate, but we believe it is very important. I said that—and it preceded the turn of this new century—I said that science was the work of the 21st century, meaning that as we do science and technology, clearly we are preparing not only for bright minds, but we are also preparing this economy.

This morning, also, we participated in the announcing of the new Members of the Inventors Hall of Fame and to listen to some of the inventions, maybe of yesteryear, that have become commonplace, we know how important civilian investment in research is.

So I would like to pose a series of questions that I know my colleagues have offered, and I just believe it is important to bring home. I am concerned that, as we look at the budget for this year, that, in actuality, we are not focusing on how science can help create jobs. The bulk of the development work or research is housed in the Defense Department. I know that as I was leaving the room, this line of questioning was being posed. My understanding is that it is $64.6 billion. Though I will acknowledge that, for those of us concerned about health issues, I will applaud the Department of Defense in that it has done some collaborative work on health issues, and I acknowledge that. But what I am concerned about is that the work on Federal Science and Technology has gone down. It is $64.4 billion, but if you look at it, it really has not kept pace, as far as I am concerned.

And the crux of the problem is that most of our research seems to dwell on weaponry, more money for that and not enough money for civilian research, not enough money for education. And I would like all of the panel to address the question of how are we pre-

paring for a better quality of life by using science, and really, we look to the Federal Government as being at the cutting edge of research, science and technology, then the private industry tends to follow, or either they say, "You go forward first, because we don't have the capital or the where with all or the stock owners' will for us to go forward." But yet it seems that the dominance of what we are doing is in weaponry as opposed to civilian research and development. And I have a pause with that and a concern with that. And might I start from, I guess, your right to left to be able to address that question.

Dr. MARBURGER. Yes, regarding the balance of basic research, most basic research is, in fact, not performed within the Department of Defense but in the other agencies. The basic research budgets are dominated by health, biomedical research, and many other areas that do, in fact, contribute to the quality of life for all Americans. And I would go on to say that investments in Defense systems and Homeland Security systems are at the foundation of protecting the quality of life that we have in America and ensuring its future robustness and competitiveness in a very complex world.

So I think that we should not simply separate this budget into useless Defense and useful non-Defense, because the Defense budget is a very important part of the technical infrastructure of this country, and it does support a very substantial number of innovations and products that find their way into the civilian marketplace. It provides jobs for the people that our higher education community prepares.

So I think it is very important to keep this budget in context. There have been significant increases during this Administration in the Federal Science and Technology budget. It is certainly flat for this year, but within that, there are important priorities that are being addressed in the National Science Foundation, in NASA, in the Department of Energy, and the other important agencies. So I would tend to disagree with the significance of this budget with respect to American quality of life.

Dr. COLWELL. I am going to say that the activities that I would like to highlight in the National Science Foundation budget that address your question include the investment in the human and social dimensions focus that I mentioned in my introductory remarks and the social behavioral sciences. We are making an increased investment there, because we need to understand how people live in a world of change, how people make decisions and how they assess risks.

I would say another area that is very important is partnerships and innovation, and that is the connection between the research that is done and the actual transfer into industry, which Congressman Smith alluded to earlier.

And then thirdly, I would like to point out our investment that we are requesting for international cooperation. And I think that is very critical, having our students being able to interact with students of other countries in the programs that we are supporting in international research in the Office of International Science and Engineering.

And finally, I think the investment in people, the graduate fellowships, the programs that enhance student opportunities, these

are the kinds of things that lead to a safer, more stable, more secure future.

Dr. MCQUEARY. In the case of Science and Technology representing the Department of Homeland Security, we are just developing a very close relationship with the Office of Homeland Defense within the Department of Defense, because they have the requirement to transfer to the Department of Homeland Security those technologies that can be brought from the Defense area. So I see that relationship as an important part of our being able to not have to spend money that we otherwise would if we did not have that close relationship with what they are doing.

Chairman BOEHLERT. Mr. Bond.

Mr. BOND. Just very quickly, at NIST, I think that our research is tied directly to quality of life issues, unlocking the next wireless technologies and the standards there, the tissue engineering that will be so valuable in biotechnology, nanomanufacturing, advanced manufacturing that offers great advantage to American companies, and we will leave it at that.

Dr. ORBACH. Within the Office of Science and the Department of Energy, the President's FreedomCAR and Hydrogen Fuel Initiative will give us energy independence and will give us energy security, something critical for our way of life. And this budget represents a real increase in our investment in these areas. And you will see that, I believe, showing up in the robustness of our economy.

Chairman BOEHLERT. Thank you very much.

The gentlelady's time has expired.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

Finally, and quickly, Mr. Bond, I am not trying to pick on you, but you were just—happened to be thrown a tough, hot potato. Your solution to many of the problems was creative thinking. And I would like to take advantage of your creative thinking, and if you could, the ATP, as Mr. Udall pointed out, was completely zeroed out. I would assume there is going to be some kind of transition cost if that occurs and there is some contractual obligation, which means that that money has got to come from somewhere, which is probably NIST or somewhere else. So if you could let me know what you think those costs would be, and where you intend to get those, that would be helpful. And with the MEP program, also your creative thinking on what you are going to do, and then what impact that is going to have on the states. And if you don't mind, you can just send that to me in a letter later, because you may not have it all right now.

Mr. BOND. Sure. I would be happy to do that.

I wanted to just draw attention to one thing on MEP, because I think the Chairman and other Members of the Committee would be interested. We would love to work with this committee to get statutory authority for the MEP network to be able to have access to private sector direct money, whether non-profit or for-profit. They do not have that authority now. They have federal dollars, they have state dollars, and they have fees that they raise, but if, for instance, a foundation wanted to invest some money to assist U.S. small manufacturers and non-profit foundations, we can not receive those funds right now, and that is one of the things——

Chairman BOEHLERT. Yeah, we are rather enamored with that proposal——

Mr. BOND. Right.

Chairman BOEHLERT [continuing]. But we want to continue the MEP program. We want that to supplement, not replace.

Mr. GORDON. And you might also let us know who are some of those agencies or companies that are volunteering to do that.

Chairman BOEHLERT. Yeah, and if you would, Mr. Bond, direct your response to the Committee for the attention of Mr. Gordon, but I want all Committee Members to share your response.

Mr. GORDON. Thank you.

Chairman BOEHLERT. I said he would be last, but I lied. That is not the first time it has happened on Capitol Hill. A brief comment from Dr. Ehlers, and then I will close with a brief comment.

Ms. JACKSON LEE. Mr. Chairman.

Mr. EHLERS. Thank you.

Ms. JACKSON LEE. Mr. Chairman, before Dr. Ehlers, may I ask a question that goes on the record so I can get an answer in writing?

Chairman BOEHLERT. All Members will be entitled to ask questions in writing, and we would expect the panelists to be timely in their response, but we are trying to wrap this up. We promised people 1:00, and we are going to try to stick to that as close as possible.

Dr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman.

I just want—two quick comments. First of all, I made some fairly strong statements, and I want to make clear that I have complete and utter respect for the members of the panel. I think you are—I, in fact, I have some sympathy for you, too. I think you have been asked to defend some things that are not defensible. But I personally have great respect for you and appreciate the service that you are giving. It is not an easy job.

Dr. MARBURGER. Thank you.

Mr. EHLERS. The second comment was Mr. Smith asked a very searching question: Why is our applied—pardon me, our basic research being applied in other countries and not ours? And the answer is most other countries put substantially more money into technology transfer than we do, and at the same time, we are zeroing out ATP and having trouble with MEP, and I hope we can reverse that.

Chairman BOEHLERT. Good point.

Mr. EHLERS. Thank you very much.

Chairman BOEHLERT. Thank you very much.

And finally, Dr. Orbach, a quickie. As you know, we have been supportive of U.S. participation in ITER [International Thermonuclear Experimental Reactor], as long as U.S. involvement is limited. With the continuing disputes over location, can you assure us that the U.S. cost will not increase? As I understand it, the cost projected, a life cycle, $700 million?

Dr. ORBACH. That is correct. And I can assure you that. I can also tell you that not only will our contribution be capped at the current level, but also that the level of performance will be maintained so that the baseline will follow the current projections.

Chairman BOEHLERT. Thank you for that assurance.

And thank all of you for being such valuable resources. And once again, Dr. Colwell, arrivaderci.

The hearing is adjourned.

[Whereupon, at 1:10 p.m., the Committee was adjourned.]

Appendix 1:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by John H. Marburger III, Director, Office of Science and Technology Policy, Executive Office of the President

Questions submitted by Chairman Sherwood Boehlert

Q1. Cyber security research and development (R&D) is very important to the Committee, as indicated by our Cyber Security Research and Development Act signed into law in 2002. At last year's budget hearing, we were given assurance that details regarding funding levels and coordination of programs would be provided in upcoming budgets. Yet the fiscal year 2005 budget still does not provide government-wide breakdowns of the current and proposed funding for cyber security R&D. Please provide the Committee with this breakdown.

A1. The Office of Management and Budget (OMB) expects to be able to provide this information shortly.

As is the case for detailed information in other areas of R&D coordination, it can take considerable time and effort to identify activities and funding levels that are relevant to a specific research topic such as cyber security R&D. Identifying the appropriate scope for what to include or exclude as part of a cyber security data collection has been difficult. It is a challenge to identify proportions of information technology (IT) security programs or IT R&D programs that are specifically devoted to cyber security R&D. Finally, given other data we collect on homeland security and information technology R&D, we want to understand how these and other data collections interrelate as we report them, to maximize their quality and consistency.

Q2. Last year, the Office of Science and Technology Policy led an interagency task force that evaluated federal programs related to high-performance computing. What results came out of that effort? How did the task force affect the fiscal year 2005 request for the interagency Networking and Information Technology R&D program?

A2. The High-End Computing Revitalization Task Force (HECRTF) to which you refer gathered an array of information from academia, government and national labs, and industry through 84 solicited white papers, a workshop, and meetings with industry representatives. The draft Task Force Plan was completed too late to have significant influence on FY 2005 budget deliberations for most of the participating federal agencies. It is expected that all participating agencies will take the plan into account as they form proposals for the FY 2006 Budget.

Q3. Even though the Administration considers nanotechnology a priority, the budget proposes to reduce nanotechnology funding at the National Institute of Standards and Technology, the National Aeronautics and Space Administration, and the Department of Defense. Please provide the rationale for the proposed nanotechnology cuts at each of these three agencies.

A3. The decrease in the amount requested for the Department of Defense (DOD) in FY 2005 versus estimated spending in FY 2004 reflects the scheduled completion of a number of programs, mainly within the Defense Advanced Research Projects Agency (DARPA), in FY 2004. Within the National Institute of Standards and Technology (NIST), of the $63 million estimated to be spent for nanotechnology R&D in FY 2004, approximately $53 million was within the NIST core budget, and nearly $10 million was under the Advanced Technology Program (ATP). Thus the FY 2005 request of $53 million represents stable funding for the NIST core nanotechnology program. The National Aeronautics and Space Administration's (NASA) FY 2005 request of $35 million for nanotechnology R&D is an increase over the FY 2004 request ($31 million). When the FY 2005 Budget was being planned, Congress had yet to pass the FY 2004 appropriations, which increased spending to $37 million.

Q4. The President's budget proposes an overall decrease of $43 million for the Climate Change Science Program. Within that program, however, the budget requests a $70 million increase for the Climate Change Research Initiative, which supports targeted, short-term climate research activities. Please describe more specifically what climate change research activities would receive increased funding within the President's request. What activities within the larger program is the Administration proposing to decrease, terminate or transfer in order to arrive at an overall decrease for climate change research?

A4. The edition of "Our Changing Planet" that covers fiscal years 2004 and 2005 is expected to be available shortly and will provide detailed program summaries and funding tables for each Climate Change Science Program (CCSP) agency.

The largest dollar increase for the Climate Change Research Initiative (CCRI) comes from additional investment in NASA's "Glory" mission—designed to improve our understanding of aerosols and their impact on global climate. The 2005 Budget includes an increase of $42 million for this mission. Other CCRI increases are in National Oceanic and Atmospheric Administration (NOAA) programs (+ $29 million) aimed at reducing the scientific uncertainty associated with aerosols and the carbon cycle as well as accelerating progress in developing a global ocean observing system.

The drop in total CCSP funding is primarily due to a decrease in NASA's Earth Science budget. While NASA's CCSP research efforts increase, the budget for space-based observations is reduced by some $75 million. This decrease is due to the natural down cycle resulting from completion of the initial Earth Observing System, the deferral of a new mission to monitor global precipitation and the cancellation of a proposed mission to ensure continuity in the measurement of winds on the ocean surface. However, NASA's Earth science program will continue to provide key data sets and building blocks required for climate science and a comprehensive Earth observing system. In addition to the aerosol mission discussed above, new research-oriented missions to measure ocean salinity and carbon dioxide concentration are supported in the 2005 Budget.

There are some reprioritizations within NOAA's climate program as well. While NOAA's overall CCSP contribution is increased by nearly $20 million, legacy programs in global change, including several Office of Global Program grant programs, have been reduced to accommodate increased investment in CCRI priorities.

These changes are the result of a systematic analysis of priorities within CCSP.

Q5a. Because of its role and expertise in emergency response to chemical contamination, the Environmental Protection Agency (EPA) plays an important role in homeland security R&D. For example, EPA was instrumental in removing anthrax and ricin from Senate office buildings, and has received substantial funding for building decontamination research over the last few years. Yet the budget proposes to eliminate the program. What is the rationale for this action?

A5a. The Environmental Protection Agency's (EPA) National Homeland Security Research Center (NHSRC) was established to conduct research in support of drinking water and wastewater infrastructure protection, decontamination after an intentional release of chemical or biological materials, and risk assessment for rapid response to a terrorist event. While the President's 2005 Budget does not provide new funding specifically for building decontamination research, it continues to support each of these critical activities. In fact, the Budget allows EPA to continue decontamination research, keeps the program's technical staff intact, and enables EPA to meet its core homeland security responsibilities.

EPA has received significant funding for building decontamination research over the last two years. In fact, EPA had sufficient unobligated funding at the beginning of this fiscal year that it was able to move projects scheduled for FY 2005 into FY 2004. The Administration anticipates that the level of funding received to date will be sufficient to complete EPA's major priorities and continue program activities through FY 2005 using prior year funds. Decontamination research and development projects are being conducted at other agencies as well. For example, protocols are being developed for large-scale decontamination after a chemical, biological, or radiological attack including personal decontamination systems for processing large numbers of individuals. Research also is being conducted to improve decontamination chemicals and personal protection equipment, as well as to develop advanced methods for decontamination of food. You can see below that EPA's decontamination research program represents only a small portion of the U.S. Government's investment in decontamination research across the federal agencies with this expertise.

Q5b. For fiscal years 2003 and 2004 and for the 2005 request, please provide a breakdown, by agency, of how much the Federal Government spent (or will spend) on R&D related to building decontamination.

USG Investment in Decontamination R&D[1] by Agency

		FY2003	FY2004	FY2005 Request
EPA		(in $M)	(in $M)	(in $M)
	Building decontamination research	49.7	8.2	0
	Decontamination safe levels research	0	0	2.0
	EPA Total	**49.7**	**8.2**	**2.0**
DHS				
	Chem. Decon. (see below)	-	6.6	7.9
	Bio. Decon. (see below)	5.0	5.5	6.1
	Rad. Decon. (see below)	5.0	9.0	*13.0
	DHS Total	**10.0**	**21.1**	**27.0**
HHS				
	FDA –Study of decon workers' health	0.012	0	0
	CDC – Environmental Microbiology decon	1.1	0.3	0
	HHS Total	**1.1**	**0.3**	**0**
Non-DOD federal department investment in decon R&D		**60.8**	**29.6**	**29.0**
DOD				
	Joint Services Sensitive Equipment Decon (JSSED)	6.5	16.8	13.9
	Joint Services Family of Decon Systems (JSFDS)	4.4	8.4	3.3
	"Immune Building" Program	29.3	39.3	21.0
	DOD Total**	**40.2**	**64.5**	**38.2**
USG Investment in Decon R&D		**101.0**	**94.1**	**67.2**

[1] Research and Development (R&D) is defined in this data call as activities comprising creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications (e.g. at DOD 6.1 - 6.4). Funding to take prototypes to operational system development is not included in the R&D definition for this exercise.

*Project co-funded with DOD DARPA
** DOD possesses more programs in decontamination R&D that cannot be captured using the 2004 data call

Detailed explanation of DHS program areas:
Chem Decon: Technologies will be developed for critical current shortfalls in operational decontamination, to include the decontamination of areas that are difficult to reach with near-tern approaches but which cannot be easily replaced (e.g. facility ductwork or water systems).
Bio Decon: Development and demonstration of technologies, systems, and protocols needed to efficiently and effectively decontaminate facilities and large exposed outdoor areas to restore them to full operations.
Rad Decon: Decontamination of urban areas, scenario analysis, responder playbooks, development of tools for rapidly identifying those exposed to significant radiation levels. Co-funded with DARPA.

Questions submitted by Representative Bart Gordon

Q1. **Nanotechnology Funding**—*Last year Committee Democrats offered an amendment to the nanotechnology bill mandating that five percent of all federal nanotechnology funding would go toward societal and ethical aspects of the program. This was based on the formula used in the Human Genome Program. The Committee leadership, reflecting Administration views, opposed the amendment and it was not adopted. Does the Administration still think that the five percent*

mandate is a bad idea? What fraction of nanotechnology funding would go towards societal/ethical concerns in FY 2004 and in the FY 2005 budget? Please provide a breakdown of these funds by agency and by subject. [NOTE: Do not include research into environmental applications of nanotechnology in this total.]

A1. The Administration generally believes that it is preferable to allow for flexibility in R&D program management instead of establishing formula-based set-asides. From its inception, the National Nanotechnology Initiative has emphasized the need for addressing the societal, ethical, legal, and workforce implications of nanotechnology. These issues are being addressed through a number of activities, including:

Societal implications. NSF expects to spend $3.6 million in FY 2004 and a minimum of $2.5 million in FY 2005 on societal implications of nanotechnology research through a combination of specified nanotechnology programs and core programs. Additional funding may be directed to such research in FY 2005 if the quantity and quality of proposals warrants. Among currently funded projects is an interdisciplinary research program at the University of South Carolina that draws upon members of the philosophy, chemistry, and anthropology departments, among others.

Education and workforce preparation. NSF plans to spend $10.5 million in FY 2004 and $24.7 million in FY 2005 on educational programs relating to nanotechnology. These programs are aimed at all levels, from K–12 to post-graduate, and address the developing need for a workforce with suitable training and skills to design, work, and manufacture at the nanoscale. Curriculum development for K–12 lays the groundwork for workforce training and also helps to create an educated public that can make informed decisions about science and technology in general, and nanotechnology in particular. In the past, DOD and NIH have spent $2 million annually on educational programs related to nanotechnology.

Environmental and health effects. In addition to research on applications that may prove beneficial to the environment and public health, the NNI funds research on the potential health and environmental risks of nanotechnology. Such research addresses perhaps the most pressing societal implication of this new technology. Collectively, the agencies participating in the NNI plan to spend in FY 2004 $3.2 million on health implications research and $5.3 million on environmental implications research. In FY 2005, NSF intends to award $17.6 million on understanding the fundamental effects of nanostructures on the environment, and EPA intends to award $5 million for environmental effects research. Moreover, EPA is working to partner with other agencies, such as NSF and the National Institute of Occupational Safety and Health (NIOSH), on a joint solicitation for proposals in this area.

In order to protect public health and the environment, it is important to understand the properties of nanomaterials that are likely to make their way from the laboratory to the marketplace. To address this issue, the National Toxicology Program (an interagency program within the Department of Health and Human Services) has initiated toxicological studies to begin to determine the risks of exposure to certain engineered nanomaterials through skin, oral and inhalation exposures. In FY 2004, $0.5 million will go towards these studies, which will grow to approximately $2 million in FY 2005.

In addition to the above activities, the Nanoscale Science, Engineering, and Technology (NSET) Subcommittee of the National Science and Technology Council, through the National Nanotechnology Coordination Office (NNCO), is funding a project at the North Carolina State University to study methods by which the public can be informed of and provide input on nanotechnology. NSET and NNCO personnel also devote resources toward public outreach activities aimed at various groups, including the public, school children, industry and small businesses, and researchers. Along with the educational programs described earlier, such activities help to address public concerns and, in some cases, misconceptions, about the possible effects of nanotechnology.

Q2. **Off-Shoring of Jobs—***There is growing concern about jobs moving overseas. Increasingly, it is high-tech service jobs (e.g., radiologists, software developers) that seem to be moving.*

Q2a. What is this Administration's philosophy about off-shoring of high-tech jobs? Is it a problem or is it a valuable by-product of free trade, as the President's chief economist suggested recently?

A2a. The President believes the best way to deal with the issue of off-shoring is to make America the best place in the world to do business. A key priority of this Administration is to create jobs in America and, as the President has said many times,

he will not be satisfied until every American who seeks work can find a job. More than 1.4 million jobs have been created since last August.

The most important way to support growth in jobs is to maintain a strong pace of economic activity. Administration initiatives aimed at promoting economic growth, such as the substantial tax relief package passed by Congress, have softened the impact of the recession and helped put the economy on the road to recovery. We have seen the results of these actions in the robust recovery that has been underway since the middle of last year. Real GDP has expanded at an annual rate of 5.0 percent over the last year. This is the best four-quarter performance in nearly 20 years and the best among the major developed economies.

Policy should also foster an environment in which businesses will expand and jobs will be created. The President's initiatives to reform the tort system, to ensure a reliable energy supply, to make health care more affordable, and to streamline the regulatory burden will remove barriers to prosperity and promote sustained growth in output and employment.

Engagement with the world economy represents another key to the prosperity of the U.S. economy. Open markets allow American firms to sell world-class products and services in the large global economy (95 percent of the potential customers for American products live outside the United States). Open markets also give American households the ability to stretch budgets and the freedom to buy the greatest variety of goods and services at the best prices. Finally, free trade allows American businesses to buy the best equipment and materials, and this benefits their workers, owners, and customers.

At the same time that we recognize the gains from free and open markets, we must appreciate that any economic change, whether arising from trade or technology, can cause painful dislocations for some workers and their families. Public policy should ease the transition and help workers prepare for the global economy and the jobs of the future. The President's "Jobs for the 21st Century" initiative will help address this by preparing U.S. workers to take advantage of better skilled, higher paying jobs. In addition, since 2002, spending on Trade Adjustment Assistance has nearly tripled, and the President's FY 2005 Budget provides more than $23 billion for worker training and employment programs.

Q2b. What are the implications of off-shoring of high-tech jobs on the future need for scientists and engineers in this country?

A2b. The President's Council of Advisors on Science and Technology (PCAST) has defined what they call the Nation's "innovation ecosystem," which has produced the global economic leadership and high standard of living our country enjoys. Future generations of scientists and engineers will be key to keeping our National innovation ecosystem strong, which is why the President requested an increase in the Department of Education's Math and Science Partnerships (MSP) program—an important component of the President's Jobs for the 21st Century Initiative. The United States has achieved and solidly retains world leadership as measured by prosperity and efficiency from two related engines of growth—innovation and productivity. This growth is furthered by the federal investment in R&D, for which this Administration has provided record levels of funding.

By promoting strong economic growth and encouraging innovation, the President's policies have supported the robust recovery that the economy has been experiencing since the middle of last year and they will also help economic activity move onto a long-run path of strong sustainable expansion. Growing economies both at home and abroad will provide an expanding market for the services of scientists and engineers in this country.

Q3. **Roadmap for High-End Computing—***The fact sheet released on the Networking and Information Technology R&D budget refers to the efforts of the High-End Computing Revitalization Task Force to develop an interagency R&D roadmap for high-end computing core technologies and a federal high-end computing capacity and accessibility improvement plan.*

Q3a. What is the status of the roadmap and plan? Will they be published?

A3a. The roadmap and plan, entitled "Federal Plan for High-End Computing," was released at a House Science Committee hearing on May 13, 2004.

Q3b. Did the roadmap influence the FY 2005 budget request, and if so, in what way? Are there specific agency programs proposed to implement them?

A3b. The draft Task Force Plan was completed too late to have significant influence on FY 2005 budget deliberations for most of the participating federal agencies. It

is expected that all participating agencies will take the plan into account as they form proposals for the FY 2006 Budget.

Q3c. What is the relationship between the High-End Computing Revitalization Task Force and the interagency working group that has been in place for many years to coordinate and plan the Networking and Information Technology R&D program?

A3c. The High-End Computing Interagency Working Group (HEC IWG) of the Networking, Information Technology Research and Development (NITRD) program has been responsible for the coordination of information technology for high-end computing across federal agencies for more than a decade. The High-End Computing Revitalization Task Force, coordinated through the National Science and Technology Council, was charged by OSTP to "develop a plan to guide future federal investments in high end computing." Most of the members of the HEC IWG were Task Force participants. However, recognizing that answering this charge would require expertise in areas not currently represented on the HEC IWG (primarily regarding certain scientific applications related to high-end computing), the Task Force was augmented with agency representatives having this expertise.

Q4. **IT Plan—***Under the High Performance Computing Act of 1991, the annual implementation plan for the interagency Networking and Information Technology R&D program is due at the time of the President's budget submission. When will it be delivered to Congress?*

A4. The NITRD Supplement to the President's FY 2005 Budget (often called the "Blue Book") is expected to be ready for transmittal to the Congress this summer.

Q5. **MEP—***Your testimony touches on the Administration's three criteria for judging federal programs—namely relevance, quality, and performance.*

Q5a. Please rate the MEP program. How does it score on each of these three criteria?

A5a. The Office of Management and Budget rated the MEP program using the Program Assessment Rating Tool (PART). Because MEP Centers provide extension services and do not conduct R&D, the program was rated according to the criteria for competitive grant programs and not according to the R&D criteria noted above. Overall, MEP was rated as moderately effective. The review found that the program was well-managed by NIST. MEP centers are established through open competitions, and center activities are closely monitored by MEP staff for performance. MEP's annual performance measures do demonstrate benefits to MEP firms, but it is difficult to identify the impact of MEP on the small manufacturing community as a whole. The review also questioned the appropriateness of taxpayer support for services that benefit individual firms (e.g., increased sales, capital investment, and inventory savings) and are similar to services provided by private consultants.

Q5b. Based on these ratings, explain why you the Administration proposed terminating MEP in 2004 and cutting it to one-third of historical funding levels in FY 2005.

A5b. While the PART helps inform budget decisions, it is not the only consideration. The Budget advances three national priorities: winning the war on terror, protecting the homeland, and strengthening the economy. These priorities reflect changing needs and require making difficult budgetary choices. The Budget proposes $39 million for MEP, equal to the amount provided in 2004.

Under the program's original authorization in 1988, federal assistance to MEP centers was to be ended after six years; currently, only two centers are less than seven years old. While this original funding principle was relaxed by authorizing legislation in 1998, the Administration believes that as the centers provide services comparable to, and in some cases competitive with, private consulting, federal support for the centers can and should be reduced. The Department of Commerce has developed a series of reforms to improve the efficiency of the centers and reduce their reliance on taxpayer funding.

Q6. **Student Visas—***Some universities have reported problems with foreign graduate students being able to obtain visas to enter the U.S. This has occurred with new students and with enrolled students attempting to return to the U.S. after brief visits home. What is being done to address this problem, and does your office interact with the Departments of State and Homeland Security to help ensure the visa approval process is not unnecessarily impeding university-based research?*

A6. Yes, OSTP works with the Departments of State and Homeland Security and others to review policies that may contribute to student visa delays, to facilitate interagency efforts to seek improvements in the visa process now that SEVIS and USVISIT are in place, and to provide policy guidance on visa, immigration and entry–re-entry policy issues that impact international students and researchers. The Departments of State, Justice and Homeland Security and other relevant agencies, including OSTP and the Homeland Security Council, are working to improve the efficiency and effectiveness of the visa process, including the entry–re-entry policies. OSTP is a full participant in this ongoing process and focuses primarily on S&T-related (Mantis) and student visa issues.

Q7. **Tracking of Foreign Students—***Please give us a status report on the implementation of SEVIS, the computerized tracking system for foreign students.*

A7. SEVIS implementation is underway and ongoing. The Department of Homeland Security (DHS) put in place a special support team to facilitate the fall arrivals, which was well-received by the university community. Some fraudulent cases were discovered and dealt with at ports of entry. DHS also conducted a major "customer service" outreach effort on December 11, 2003—"Foreign Student and Exchange Visitor Issues Forum"—to compile a list of residual issues, and instituted a weekly conference call to continue the open dialog and to address both technical and policy issues. DHS reconvened its special team to facilitate the re-entry process of international students after the Christmas break. Additional institutions are applying to join the SEVIS program. OSTP believes that many of the original concerns about SEVIS have been resolved.

Q8. **Earmarks—***In both your written and oral testimony, you complained about the negative impact of Congressional earmarks on federal research portfolios. Please provide us with your plans for ameliorating the impacts of earmarks. Specifically:*

Q8a. Have you performed a legal analysis to determine whether existing laws may require competition on earmarks that are specified in report language? If so, what agencies are covered by these procurement laws?

Q8b. Have you encouraged agencies to work with earmarked institutions so that the output of the project is consistent with agencies' missions? Or do most agencies simply write a check for the earmark?

A8a,b. The Administration appreciates your interest and help in this matter. As I know you are aware, OSTP concludes that earmarks undermine and crowd out merit-based processes for best allocating our important research investments. We estimate that $2.2 billion of the Federal Science and Technology budget was earmarked in fiscal year 2004. After accounting and adjusting for these diverted resources from more merit-based, competitive awards for our national S&T priorities, the President's FY 2005 Budget actually includes a three percent increase for the national research portfolio, rather than the 0.4 percent cut that results if parochial earmarks are continued. In the case of construction programs and R&D programs, 10 USC 2361 requires DOD to use competitive procedures in the award of a grant or contract to a university or college. This requirement has helped the Department to make some awards through a more merit-oriented process than might otherwise have been the case. Also, DOD awards officers generally try to make sure that earmarked funds are applied against military needs, to the degree possible under the terms of the earmark. However, the fact that most earmarks are targeted to specific institutions or specific geographical locations, or address narrowly conceived solutions to needs that may or may not be of high priority to the Nation's defense means that, on average, the funds cannot be applied as effectively as through an allocation approach that is merit-based from conception through the award. In addition, the number of earmarks in the DOD S&T program and the amount of additional administrative workload required to execute earmarks have significantly hurt the Department's ability to execute the rest of its S&T program in a timely manner. Certainly, some agencies have had success in working with earmarked institutions to guide the relevance of the earmarked effort, but success is mixed across the agencies. The Administration has more work to do to investigate previously successful and new ways to address research earmarks, including the specific ideas you suggest. Going forward, we would be most interested in speaking to you, your staff and other stakeholders about your ideas and some of our own for avoiding or improving research earmarks.

Q9. **Science Education—***The fact sheet your office released on science education support in the FY 2005 budget request indicates that the NSF Math and Science*

Partnerships program is being moved to the Department of Education but does not give a rationale for this action.

Q9a. Since the President signed the bill authorizing the NSF program only a year ago, what has changed—is NSF failing to implement the program adequately?

A9a. The President's Budget FY 2005 Budget includes a total of $349 million, for the joint Math and Science partnerships (MSP) program at the Department of Education and the National Science Foundation (NSF), a $61 million increase over the 2004 level. The decision to consolidate the MSP program in the Department of Education positions the program closer to the classroom and to actual teaching practices. The NSF supports a number of other programs aimed at developing more effective ways of involving universities in efforts to improve both pre-service and in-service training for math and science teachers. These efforts will continue. NSF will retain $80 million of MSP to continue ongoing commitments.

Q9b. Since the partnerships program is intended to forge links between education practitioners and science, math and engineering faculty at institutions of higher education, why does the Administration believe the Department of Education is better suited to accomplish this goal than NSF?

A9b. The consolidation of the MSP in the Department of Education reflects a desire to focus the program on integrating research-proven practices into classroom settings and a desire to focus the impact of the program more directly at the local level. Consolidating the MSP at the Department of Education will place this program at the agency best positioned to work closely with state and local educational systems to implement research-based teacher enhancement efforts within the local school systems.

Q10. **International Scientific Cooperation—***Your statement does not address international scientific cooperation. Even in the depths of the Cold War, we had a productive scientific relationship with the Soviet Union that provided us with many benefits. And now—at a time when this country desperately needs some positive diplomatic initiatives—science may offer many wonderful opportunities in this area.*

Q10a. What initiatives do we have to re-invigorate scientific relations with countries in the Middle East?

A10a. We have launched several initiatives aimed at the nations of North Africa, the Middle East, and South Asia. For the first time, we are close to signing umbrella agreements for cooperation in science and technology with Morocco, Tunisia, and Algeria (the three countries generally referred to as the Maghreb). Based on the findings of an interagency assessment team, which visited the science establishments of those countries in 2003, there is significant interest in the U.S. scientific community in cooperation with the three neighboring countries of the Maghreb. Agreements have been drafted, circulated to the interagency community, and we expect they will soon be signed, opening the way for an unprecedented, wide array of science and technology (S&T) cooperation.

Areas in which we expect to initiate joint projects include basic research, science education, meteorology and weather forecasting, seismic research, basic space science and remote sensing, health sciences and public health, watershed management, marine research (including coastal research, aquaculture and fisheries management), environment and biodiversity protection, energy and alternative energy research and development, information and communications technology, and all facets of biotechnology.

In Egypt, we have expanded funding and S&T cooperation under the U.S.-Egypt Science and Technology Joint Board, which operates under the bilateral umbrella S&T agreement. This program, now funded at approximately $1.5 million per year, supports linkages between U.S. agencies and their Egyptian counterparts through collaborative grants, workshops and the training of young Egyptian scientists in U.S. institutions. Priority areas for these collaborations are agricultural biotechnology, meteorology, materials science, energy, and social sciences including economics.

In Jordan, the United States is a partner in the SESAME project, which aims to establish a synchrotron light source facility near the capital, Amman, at which scientists from the entire Middle East, including Israel, can conduct basic research in areas such as materials science. Construction of the facility was begun in March of this year at Al-Balqa University in Allan, Jordan, about 30 kilometers from the capital. The project is being undertaken under the umbrella of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), of which the U.S. is now

a member. The idea for the project originated between Stanford's Linear Accelerator Center (SLAC) and the DESY Synchrotron Center in Germany. A German synchrotron, which has been replaced, was donated as the basis for the project, and Stanford is donating a number of Department of Energy (DOE) components, surplused by the recent upgrade of their existing synchrotron to a third generation facility. DOE is currently working with the Department of State on sorting out the international legal aspects of this transfer.

Q10b. Will we aggressively reach out to China in our new space initiative?

A10b. The President's Space Vision explicitly calls for the participation of international partners in this long-term effort to develop space-faring capability, asking NASA to "pursue opportunities for international participation to support U.S. space exploration goals." Other countries have valuable contributions to bring to this effort in terms of engineering capabilities, hardware, human resources, expertise, space experience and, of course, financial resources.

As of now, no country, including China, has been excluded as a potential partner. A decision to enter into cooperation with any country would be based on several factors: the partner's potential contribution; the status of bilateral relations and S&T cooperation with that country; and foreign policy and national security considerations. If Chinese participation would advance the goals of the space vision and is consistent with broader U.S. policy objectives, we would consider it at the appropriate time.

Q10c. What is this Administration doing that is new to utilize S&T as a diplomatic tool?

A10c. President Bush announced in 2002 that the United States would rejoin UNESCO after an absence of 18 years. This became a reality in October, 2003. OSTP has spearheaded the engagement of the United States scientific community with UNESCO's science division. We expect to strengthen ongoing collaborations in oceans, fresh water, mitigation of natural hazards and disasters, and we also plan to make science and engineering education an area of emphasis. UNESCO's focus on the developing world makes this a unique and valuable platform for us to connect with developing countries in science and technology.

This spring, OSTP concluded a meeting of senior G–8 policy and research officials in Washington, to coordinate planning for research in three priority areas designated by the G–8 leaders at last summer's Evian Summit. The meeting concentrated on three topics: global observations, cleaner and more efficient energy technologies, and agricultural productivity and biodiversity. The G–8 partners also considered how best to assist developing nations that have their own research programs in these areas.

The United States has recently concluded umbrella S&T agreements with Pakistan, Bangladesh, and the Maghreb (Morocco, Algeria and Tunisia), based on a new model expressly developed to facilitate S&T cooperation with developing countries. This new style S&T agreement puts the emphasis on capacity building in our S&T partner countries, while relaxing the requirement for both partners to bring equal resources to the table, a constraint which had previously limited our S&T agreements largely to advanced industrial nations.

Another initiative begun under this Administration which makes successful use of science and technology as a diplomatic tool is the Embassy Science Fellows Program run by the State Department. This program places scientists from U.S. agencies in American Embassies abroad, in response to requests from posts, to work on S&T related projects and establish liaisons with the science communities of the host countries. Over the past three years this program has expanded with each cycle and now enjoys the participation of scientists from NSF, the United States Geological Survey, NOAA, the U.S. Department of Agriculture, and EPA.

Q11. **Union of Concerned Scientists Report—***Recently, the Union of Concerned Scientists issued a report critical of the Administration's use of science. Do you intend to produce a point-by-point response to the UCS report? If so, please provide us with a copy of your response.*

A11. On April 2, I submitted a statement and a more comprehensive response for the record, to reply to questions raised during Senate and House Appropriations Subcommittee hearings regarding a document issued by the Union of Concerned Scientists. I have attached a copy of the response I submitted to Senate Appropriations Subcommittee on VA, HUD and Independent Agencies Chairman Christopher Bond, and to other Members of the Subcommittee, and to House Appropriations Subcommittee on VA, HUD and Independent Agencies Chairman James Walsh, and to other Members of the Subcommittee. *[The information referred to follows.]*

STATEMENT OF THE HONORABLE JOHN H. MARBURGER III

Scientific Integrity in the Bush Administration

APRIL 2, 2004

President Bush believes policies should be made with the best and most complete information possible, and expects his Administration to conduct its business with integrity and in a way that fulfills that belief. I can attest from my personal experience and direct knowledge that this Administration is implementing the President's policy of strongly supporting science and applying the highest scientific standards in decision-making.

The Administration's strong commitment to science is evidenced by impressive increases devoted to federal research and development (R&D) budgets. With the President's FY 2005 budget request, total R&D investment during this Administration's first term will have increased 44 percent, to a record $132 billion in FY 2005, as compared to $91 billion in FY 2001. President Bush's FY 2005 budget request commits 13.5 percent of total discretionary outlays to R&D—the highest level in 37 years.

In addition to enabling a strong foundation of scientific research through unprecedented federal funding, this Administration also believes in tapping the best scientific minds—both inside and outside the government—for policy input and advice. My office establishes interagency working groups under the aegis of the National Science and Technology Council for this purpose. In addition, this Administration has sought independent advice, most often through the National Academies, on many issues. Recent National Academies reviews of air pollution policy, fuel economy standards, the use of human tests for pesticide toxicity, and planned or ongoing reviews on dioxin and perchlorate in the environment are examples. The Administration's climate change program is based on a National Academies report that was requested by the Administration in the spring of 2001, and the National Academies continues to review our programs and strategic research planning in this field. The frequency of such referrals, and the high degree to which their advice has been incorporated into the policies of this Administration, is consistent with a desire to strengthen technical input into decision-making.

Climate change has proven to be a contentious science-related issue. President Bush clearly acknowledged the role of human activity in increased atmospheric concentrations of greenhouse gases in June 2001, stating "concentration of greenhouse gases, especially CO_2, have increased substantially since the beginning of the industrial revolution. And the National Academy of Sciences indicates that the increase is due in large part to human activity." That speech launched programs to accelerate climate change science and technology to address remaining uncertainties in the science, develop adaptation and mitigation mechanisms, and invest in clean energy technologies to reduce the projected growth in global greenhouse gas emissions. In 2004, the U.S. will spend approximately $4 billion in climate change science and technology research.

The President created the new U.S. Climate Change Science Program (CCSP) to refocus a disorganized interagency activity into a cohesive program, oriented at resolving key uncertainties and enhancing decision-making capabilities. The Strategy was heartily endorsed by the National Academies in its recent review. Their report, *Implementing Climate and Global Change Research—A Review of the Final U.S. Climate Change Science Program Strategic Plan,* stated "In fact, the approaches taken by the CCSP to receive and respond to comments from a large and broad group of scientists and stakeholders, including a two-stage independent review of the plan, set a high standard for government research programs.. . .Advancing science on all fronts identified by the program will be of vital importance to the Nation."

In this Administration, science strongly informs policy. It is important to remember, however, that even when the science is clear—and often it is not—it is but one input into the policy process.

Regulatory decisions provide the trigger for some of the most contentious policy debates. Science can play an important role in these policy decisions, and this Administration has sought to strengthen, not undermine, this role. In fact, the Office of Management and Budget (OMB) has for the first time hired toxicologists, environmental engineers, and public health scientists to review regulations and help agencies strengthen their scientific peer review processes. This increased attention to science in the regulatory process is providing a more solid foundation for regulatory decisions. As several recent examples demonstrate, emerging scientific data has

prompted swift action by the Bush Administration to protect public health, strongly guided by advanced scientific knowledge:

- On May 23, 2003 the Environmental Protection Agency (EPA) proposed a new regulation to reduce by 90 percent the amount of pollution from off-road diesel engines used in mining, agriculture, and construction. This proposed rule stemmed from collaboration between EPA and OMB. Recent scientific data from the Harvard School of Public Health indicates that diesel engine exhaust is linked to the development of cardiopulmonary problems and also aggravates respiratory health problems in children and the elderly.
- On July 11, 2003 the Food and Drug Administration required that food labels for consumers contain new information on trans-fat content in addition to existing information on saturated fat content. This rule, requested by the White House via a public OMB letter, responded to emerging scientific data indicating that intake of trans-fats (found in margarine and other foods) is linked to coronary heart disease.
- On December 29, 2003, the Department of Transportation requested public comment on ideas for potential reform of the CAFE program. Several potential reform ideas contained in that request for comment come directly from a 2002 National Academies report on the effectiveness of the current CAFE program.

Regarding the document that was released on February 18, 2004 by the Union of Concerned Scientists (UCS), I believe the UCS accusations are wrong and misleading. The accusations in the document are inaccurate, and certainly do not justify the sweeping conclusions of either the document or the accompanying statement. I believe the document has methodological flaws that undermine its own conclusions, not the least of which is the failure to consider publicly available information or to seek and reflect responses or explanations from responsible government officials. Unfortunately, these flaws are not necessarily obvious to those who are unfamiliar with the issues, and the misleading, incomplete, and even personal accusations made in the document concern me deeply. It is my hope that the detailed response I submit today will allay the concerns of the scientists who signed the UCS statement.

I can say from personal experience that the accusation of a litmus test that must be met before someone can serve on an advisory panel is preposterous. After all, President Bush sought me out to be his Science Advisor—the highest-ranking S&T official in the Federal Government—and I am a lifelong Democrat.

I have discussed the issue of advisory committees with the agencies mentioned in the UCS document and am satisfied with the processes they have in place to manage this important function. I can say that many of the cited instances involved panel members whose terms had expired and some were serving as much as five years past their termination dates. Some changes were associated with new issue areas for the panels or with an overall goal of achieving scientific diversity on the panels. Other candidates may have been rejected for any number of reasons—this is ordinary for any Administration.

My office is involved in recommending candidates for the President's Council of Advisors on Science and Technology, the President's Information Technology Advisory Committee, and the nominating panel for the President's Committee on the National Medal of Science. I have intimate knowledge of the selection process for these committees. This process results in the selection of qualified individuals who represent a wide range of expertise and experience—the right balance to yield quality advice for the President on critical S&T issues.

The UCS document also includes a highly unfortunate and totally unjustified personal attack on a Senate-confirmed official in my office. I strongly recommended the appointment of that individual after evaluating the needs of the office and deciding that it required talents and experience that differed from previous incumbents. The attack appears to be based on a lack of understanding of the function of my office and the qualities that are required to perform them properly. Given the ease with which this ignorance could have been rectified, it is inexcusable.

I hope this response will correct errors, distortions, and misunderstandings in the Union of Concerned Scientists' document. The bottom line is that we have a strong and healthy science enterprise in this country of which I am proud to be a part.

Response to the Union of Concerned Scientists' February 2004 Document

I. THE UCS' CLAIM OF "SUPPRESSION AND DISTORTION OF RESEARCH FINDINGS AT FEDERAL AGENCIES"

The UCS' claims on "Distorting and Suppressing Climate Change Research"

- The UCS document claims that "the Bush Administration has consistently sought to undermine the public's understanding of the view held by the vast majority of climate scientists that human-caused emissions of carbon dioxide and other heat-trapping gases are making a discernible contribution to global warming."

This statement is not true. In his June 11, 2001, Rose Garden speech on climate change, the President stated that the "[c]oncentration of greenhouse gases, especially CO_2, have increased substantially since the beginning of the Industrial Revolution. And the National Academy of Sciences indicate that the increase is due in large part to human activity.. . .While scientific uncertainties remain, we can now begin to address the factors that contribute to climate change." In this speech, the President cited the National Academy's Climate Change Science report that was initiated at the Administration's request, and launched a major, prioritized scientific effort to improve our understanding of global climate change.

Moreover, the President's Climate Change Science Program (CCSP) has developed its plans through an open and transparent process. In the development of its Strategic Plan, released in July 2003, the CCSP incorporated comments and advice from hundreds of scientists both from the U.S. and around the world. The CCSP Strategic Plan received a strong endorsement from the National Academy of Sciences in a February 2004 review, which commended the work of the CCSP.

- The UCS claims that the "Bush Administration blatantly tampered with the integrity of scientific analysis at a federal agency when, in June 2003, the White House tried to make a series of changes to the EPA's draft Report on the Environment."

This statement is false. In fact, the Administrator of the EPA decided not to include a short summary on climate change. An ordinary review process indicated that the complexity of climate change science was not adequately addressed in EPA's draft document. Instead, the final EPA report referred readers to the far more expansive and complete exposition of climate change knowledge, the Climate Change Science Program (CCSP) Strategic Plan.[1] The Administration chose, appropriately, to present information in a single, more expansive and far more complete format. This choice of presentation format did not influence the quality or integrity of the scientific analysis or its dissemination.

- The UCS quotes an unnamed EPA scientist as saying that the Administration "does not even invite the EPA into the discussion" on climate change issues, and cites a previous Clinton Administration OSTP official, Dr. Rosina Bierbaum, as claiming that the Administration excluded OSTP scientists from the climate change discussions.

These accusations are wrong. The EPA, in fact, is a key participant in the development and implementation of climate change policy in the Bush Administration. The EPA participates in the development of Administration policy on climate change through the cabinet-level Committee on Climate Science and Technology Integration, which was created in February 2002. The EPA is also a member of subsidiary bodies, such as the Interagency Working Group on Climate Change Science and Technology, the Climate Change Science Program and the Climate Change Technology Program. (A table illustrating the Bush Administration's climate change program's organization can be found on page 9 of the CCSP Strategic Plan (2003)). Moreover, the EPA is a co-chair of the National Science and Technology Council's Committee on Environment and Natural Resources (CENR). CENR has oversight of and responsibility for the Subcommittee on Global Change Research. (This subcommittee holds the same membership and is functionally the same entity as the Climate Change Science Program, noted above.)

Dr. Bierbaum's claim refers to cabinet-level discussions that led to the development of the Administration's climate change organization described above. The cabinet-level discussions referenced by Dr. Bierbaum included numerous, respected federal career scientists including Dr. David Evans, former Assistant Administrator for Oceanic and Atmospheric Research at NOAA, Dr. Ari Patrinos, Associate Director of the Office of Biological and Environmental Research at the Department of Energy, and Dr. Dan Albritton, Director of the Aeronomy Laboratory of Oceanic and

[1] The 205-page CCSP Strategic Plan was released by Secretaries Evans and Abraham on July 24, 2003. The EPA *Report on the Environment* was released on June 23, 2003. The draft EPA report had contained a four-page segment on climate change.

Atmospheric Research at NOAA. Starting with these early discussions, the Bush Administration's climate change organization has fully involved climate change experts from throughout the Federal Government.

As already noted, subsequent to its initial internal discussions, the Administration submitted the draft CCSP Strategic Plan to some of the Nation's most qualified scientists at the National Academy of Sciences for review. The Academy made numerous recommendations, which the CCSP incorporated. The CCSP then resubmitted its plans to the Academy for further review, and just recently, the NAS returned a highly favorable review. The Administration developed the climate change science strategic plan through an open, back-and-forth process.

- The UCS claims that the Administration refused the request of the Natural Resources Conservation Service (NRCS) in USDA to reprint a brochure on carbon sequestration prepared several years ago and claims that this was censorship of government information.

This accusation is false. The USDA's NRCS decided not to republish the brochure for appropriate reasons. The brochure had received extensive comments from within the Department that the brochure was outdated and did not reflect significant recent decisions by USDA to address greenhouse gases. For example, in June 2003, Secretary Veneman announced that for the first time, USDA would give consideration to greenhouse gas reductions and carbon sequestration in setting priorities for conservation programs. In addition, USDA is developing new accounting rules and guidelines so that farmers and landowners can register greenhouse gas reductions and carbon sequestration activities with the Department of Energy. The Department of Energy released its accounting guidelines for greenhouse gas reporting in December 2003, and it is expected to release technical guidelines in early summer 2004. USDA is working with DOE to develop the guidelines for agriculture. The technical guidelines should include more specific information as to how farmers and ranchers could report and register greenhouse gas reductions. Once the new guidelines are available, USDA will reprint this brochure including information on how farmers can use the new guidelines.

Furthermore, there are still approximately 37,000 existing brochures available for distribution. The document is posted on the Soil and Water Conservation Society website: http://www.swcs.org/docs/carbon_brochure.pdf. Links to the document are found on the NRCS website: http://www.nrcs.usda.gov/news/releases/2000/000424.html.

The UCS' claims on "Censoring Information on Air Quality"

- The UCS claims that the Administration was withholding the publication of an EPA report on children's health and the environment in order to avoid the issue of mercury emissions by coal-fired power plants. The UCS also claims that the Administration suppressed and sought to manipulate government information about mercury contained in the EPA report.

This is not true. The interagency review of the EPA report on children's health and the environment occurred independently of the Administration's deliberations on mercury emissions from power plants. The interagency review process is the standard operating procedure for reports that include areas of scientific and policy importance to multiple agencies. As such, the report was reviewed by a number of scientists and analysts across federal agencies. During this review, other agencies expressed concerns about the report. OSTP worked collaboratively with EPA staff on addressing interagency comments to make certain that the proposed indicators had a robust scientific basis and were presented in an understandable manner.

The report contained a statement that eight percent of women of child-bearing age had at least 5.8 ppb of mercury in their blood in 1999–2000 and therefore children born to these women are at some increased risk. This information was available well before the EPA report both in raw form through the CDC and in an interagency analysis (CDC's *Morbidity and Mortality Weekly Review,* 2001) that indicated that approximately 10 percent of women of child-bearing age had blood mercury levels above the EPA reference dose, as opposed to the eight percent level noted in EPA's report. The updated analysis in EPA's report and later published in the scientific literature (*Journal of the American Medical Association,* 2003) included an additional year of data and found the level to be eight percent. These updated risk levels

were used by the Administration in the preparation of its two regulatory proposals to reduce mercury emissions from coal-fired power plants.[2]

The final report was released in February 2003, as soon as the interagency review process was completed.

- The UCS states that "the new rules the EPA has finally proposed for regulating power plants' mercury emissions were discovered to have no fewer than 12 paragraphs lifted, sometimes verbatim, from a legal document prepared by industry lawyers."

The UCS' implication that industry is writing government regulations is wrong. The reference here is to a preamble of a proposed EPA rule to control (for the first time) mercury emissions from power plants. The text in question is in the preamble, not the proposed rule itself. The preamble is intended to engage the public and encourage comments, including both assenting and dissenting viewpoints. All agencies, including EPA, openly seek public comment during rulemaking proceedings in order to obtain useful information and advice that is accepted or rejected or used in part.

Such direct use of submitted memoranda should not have occurred. However, the text at issue was taken from memoranda that were publicly presented to an advisory group made up of environmental activists, State officials, and industry representatives. These documents are openly available in the public docket. The UCS' allegations are based on text that had nothing to do with the integrity of the science used by EPA.[3]

- The UCS states that the EPA has suppressed research on air pollution; specifically that the EPA evaluated a proposed measure by Senators Carper, Gregg and Chafee to regulate carbon dioxide in addition to sulfur dioxide, nitrogen oxides, and mercury, but withheld most of the results.

This accusation is false. EPA did, in fact, provide full information to the Senators. S. 843 was introduced by Senators Carper, Gregg, and Chafee on April 9, 2003. EPA submitted a cost analysis of the legislation to the Senators in July 2003, and submitted a cost and benefits analysis in October 2003. The Energy Information Administration (EIA) has also analyzed and compared the costs of S. 843 and S. 485 (the Administration's Clear Skies proposal), and provided the analysis to Congress in September 2003.

The leaking of a draft EPA analysis was improper and unfortunate. The report underwent a standard interagency pre-release clearance process, and an intent to release always existed. Furthermore, these types of analyses have long been available and released by the Administration once completed. In fact, EPA had also analyzed a very similar bill Senator Carper introduced in 2002 and provided it to Congress in November 2002.

The UCS' claims on "Distorting Scientific Knowledge on Reproductive Health Issues"

- The UCS claims that the Administration distorted the U.S. Centers for Disease Control and Prevention's (CDC's) science-based performance measures to test whether abstinence-only programs were proving effective, and attempted to obscure the lack of efficacy of such programs.

This accusation is false. The UCS mischaracterizes the program, its performance measures, and the reasons behind changes that were made to those performance measures. There were no CDC science-based performance measures associated with this program. Currently, the Federal Government funds abstinence-only education programs through the Health Resources and Services Administration, not CDC. The

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[2] The proposed regulations include a Maximum Achievable Control Technology standard which would result in a 29 percent reduction by 2009, and a two-phase cap and trade program which will result in a 68 percent reduction when fully implemented.

[3] The background of this rulemaking and the text in question is as follows. On January 30, 2004, the EPA published a notice of proposed rulemaking to regulate mercury emissions from power plants. The language at issue, which appears in two places in the proposal's preamble, was derived from two memoranda submitted by a law firm early in the rulemaking process (March and September, 2002). In the first instance, a section of one memorandum discusses the statutory framework of Section 112 of the Clean Air Act. Administration staff largely copied this discussion into portions of its own discussion, entitled "What is the Statutory Authority for the Proposed Section 112 Rule?" The law firm had used this discussion to argue for a regime of "system-wide compliance," but EPA rejected that argument and did not propose such a regime. In the second instance, another memorandum argued that EPA should allow "sub-categorization" within existing coal-fired units under the Maximum Achievable Control Technology (MACT) regime. This discussion did not deal with any scientific issues but explained how different types of coal are typically classified. EPA largely copied several paragraphs from this document into the preamble's discussion of sub-categorization.

program was never designed as a scientific study, and so even if the original performance measures had been kept, little or no scientifically usable data would be obtained. However, other independent evaluation efforts are underway that are intended to address questions of the effectiveness of abstinence only programs.

- The UCS claims that a CDC condom fact sheet posted on its web site was removed and replaced with a document that emphasizes condom failure rates and the effectiveness of abstinence.

This accusation is a distortion of the facts. The CDC routinely takes information off its website and replaces it with more up-to-date information. Recently updated topics include anthrax, West Nile Virus, and other health issues for which new information had become available. The condom fact sheet was removed from the website for scientific review and was subsequently updated to reflect the results of a condom effectiveness review conducted by the National Institutes of Health, as well as new research from other academic institutions. The condom information sheet was re-posted with the new information.

The "Programs That Work" website was also removed because the programs it listed were limited. CDC is exploring new and appropriate means to identify and characterize interventions that have scientifically credible evidence of effectiveness. In addition, CDC is currently working on a new initiative that is aimed at better addressing the needs of schools and communities by providing assistance in selecting health education curricula based on the best evidence available.

- The UCS alleges that information suggesting a link between abortion and breast cancer was posted on the National Cancer Institute (NCI) website despite substantial scientific study refuting the connection, and only revised after a public outcry.

This claim distorts the facts. The NCI fact sheet "Abortion and Breast Cancer" has been revised several times since it was first written in 1994. NCI temporarily removed the fact sheet from the website when it became clear that there was conflicting information in the published literature. In order to clarify the issue, in February 2003 a workshop of over 100 of the world's leading experts who study pregnancy and breast cancer risk was convened. Workshop participants reviewed existing population-based, clinical, and animal studies on the relationship between pregnancy and breast cancer risk, including studies of induced and spontaneous abortions. They concluded that having an abortion or miscarriage does not increase a woman's subsequent risk of developing breast cancer. A summary of their findings, titled *Summary Report: Early Reproductive Events and Breast Cancer Workshop,* can be found at http://cancer.gov/cancerinfo/ere-workshop-report. A revised fact sheet was posted on the NCI website shortly after the workshop reflecting the findings.

The UCS' claims on "Suppressing Analysis on Airborne Bacteria"

- The UCS claims that a former Agricultural Research Service (ARS) scientist at Ames, Iowa, Dr. James Zahn, was prohibited on no fewer than 11 occasions from publicizing his research on the potential hazards to human health posed by airborne bacteria resulting from farm wastes.

This accusation is not true. Dr. Zahn did not have any scientific data or expertise in the scientific area in question. Dr. Zahn's assigned research project, as part of the Swine Odor and Manure Management Research Unit, dealt with the chemical constituency of volatiles from swine manure and ways to abate odors. In the course of this research, Dr. Zahn observed incidentally that when dust was collected from a hog feeding operation, some of the "dust" emitted from these facilities contained traces of antibiotic resistant bacteria. The recorded data were severely limited in scope and quantity, and did not represent a scientific study of human health threats.

In February 2002, Dr. Zahn was invited to speak at the Adair (Iowa) County Board of Health meeting in Greenfield, Iowa. Permission was initially granted by ARS management for Dr. Zahn to speak because it was thought that he was being invited to speak on his primary area of scientific expertise and government work, management of odors from hog operations. Permission for Dr. Zahn to speak representing the ARS at the meeting was withdrawn when it was learned that Dr. Zahn was expected to speak on health risks of hog confinement operations, an area in which Dr. Zahn did not have any scientific data or expertise.

The accusation of "no fewer than 11 occasions" of ARS denials to Dr. Zahn for him to present or publicize his research is not accurate. He was approved to report on his preliminary observations of dust borne antibiotic resistant bacteria at the

2001 meeting of the American Society of Animal Science and at a 2001 National Pork Board Symposium. He also was approved on numerous occasions to present and publish his research on volatiles and odors from swine manure. However, on five occasions he was not authorized to discuss the public health ramifications of his observations on the spread of resistant bacteria, because he had no data or expertise with respect to public health. Three of these occasions were local Iowa public community meetings; two others were professional scientific meetings.

- The UCS also claims that the USDA has issued a directive to staff scientists to seek prior approval before publishing any research or speaking publicly on "sensitive issues."

This is not true. USDA–ARS headquarters has had a long-standing, routine practice (at least 20 years) that has spanned several Administrations to require review of research reports of high-visibility topics (called the "List of Sensitive Issues"). ARS headquarters review, when required, do not censor, or otherwise deny publication of, the research findings, but may aid in the interpretation and communication of the results, including providing advance alert to others. The purpose of this review is to keep ARS Headquarters officials informed before publication and in an otherwise timely way of new developments on cutting-edge research, controversial subjects, or other matters of potential special interest to the Secretary's Office, Office of Communications, USDA agency heads (particularly those other agencies in USDA that depend on ARS for the scientific basis for policy development and program operations), scientific collaborators, the news media, and/or the general public. This practice deals with research reporting only and does not relate to the initial research priority setting process or to determining which studies will be undertaken. To the contrary, the "special issues" are mostly high-priority items and receive considerable research attention.

The UCS' claims on "Misrepresenting Evidence on Iraq's Aluminum Tubes"

- The UCS claims that the Administration was aware of disagreement among experts on the purpose of aluminum tubes that Iraq attempted to acquire and that the Administration knowingly disregarded scientific analysis of intelligence data.

Director of Central Intelligence George Tenet addressed this issue directly in his February 5, 2004, speech at Georgetown University:

> "Regarding prohibited aluminum tubes—a debate laid out extensively in the [National Intelligence] Estimate, and one that experts still argue over—were they for uranium enrichment or conventional weapons? We have additional data to collect and more sources to question. Moreover, none of the tubes found in Iraq so far match the high-specification tubes Baghdad sought and may never have received the amounts needed. Our aggressive interdiction efforts may have prevented Iraq from receiving all but a few of these prohibited items.
>
> "My provisional bottom line today: Saddam did not have a nuclear weapon; he still wanted one; and Iraq intended to reconstitute a nuclear program at some point. But we have not yet found clear evidence that the dual-use items Iraq sought were for nuclear reconstitution. We do not yet know if any reconstitution efforts had begun, but we may have overestimated the progress Saddam was making."

The UCS' claims on "Manipulation of Science Regarding the Endangered Species Act"

- The UCS claims that the Administration is attempting to weaken the Endangered Species Act.

This accusation is false. The current listing situation results from Fish and Wildlife Service (FWS) practices in place before the Bush Administration took office. The FWS listing budget is currently consumed by court-ordered listings and critical habitat designations. These court orders result from pre-2001 FWS decisions to list endangered species but not to designate associated critical habitat as required by the Act as well as to ignore pending petitions to list species. This practice resulted in a flood of litigation forcing FWS to act on petitions that had been languishing for years as well as to designate critical habitat for already listed species. Fulfilling the resulting court mandates expends all of FWS's listing budget (the Administration has taken steps to redirect additional funds to this budget account, and the President's FY05 Budget requests an increase of more than 50 percent). With respect to the critical habitat designations, officials from both the current and prior

administrations have said that these lawsuits prevent FWS from taking higher priority actions such as listing new species.[4]

This Administration is committed to working in partnership with States, local governments, tribes, landowners, conservation groups, and others to conserve species through voluntary agreements and grant programs in addition to ESA procedures. For FY 2005, the President's proposed budget includes more than $260 million in the Interior Department budget alone for cooperative conservation programs for endangered species and other wildlife. The President created the new Landowner Incentive Program and the Private Stewardship Initiative grant programs to help private landowners conserve endangered species habitat on their property. In early March 2004, for example, Secretary Norton announced $25.8 million in cost-share grants to help private landowners conserve and restore the habitat of endangered species and other at-risk plants and animals. These grants are going to support projects in 40 states and the Virgin Islands.

Because the large majority of threatened and endangered species depend on habitat on private lands, this Administration believes it is vitally important that the Federal Government provide incentives for landowners to engage in conservation efforts. The incentive programs implemented during this Administration have shown returns in the form of voluntary contributions of time and effort by landowners. These contributions provide far more to species conservation than the government could ever compel through regulatory action. This Administration is focusing on enhancing and restoring habitats of threatened and candidate species populations—thus keeping them off the list by preventing these species from becoming threatened in the first place.

> "In 25 years of implementing the ESA, we have found that designation of official critical habitat provides little additional protection to most listed species, while it consumes significant amounts of scarce conservation resources," Jamie Rappaport Clark, Director, U.S. Fish and Wildlife Service during the Clinton Administration, before the Senate Environment and Public Works Subcommittee on Fisheries, Wildlife, and Drinking Water. May 27, 1999.
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> "These lawsuits [forcing the Service to designate critical habitat] necessitate the diversion of scare federal resources from imperiled but unlisted species which do not yet benefit from the protections of the ESA." Jamie Rappaport Clark, Senate Testimony, May 27, 1999.
>
> "Struggling to keep up with these court orders, the Fish and Wildlife Service has diverted its best scientists and much of its budget for the Endangered Species Act away from more important tasks like evaluating candidates for listing and providing other protections for species on the brink of extinction." former Interior Secretary Bruce Babbitt, *New York Times* op-ed, April 15, 2001.
>
> "The best alternative is to amend the Endangered Species Act, giving biologists the unequivocal discretion to prepare maps when the scientific surveys are complete. Only then can we make meaningful judgments about what habitat should receive protection." Bruce Babbitt, *New York Times,* April 15, 2001.

- The UCS claims that the FWS inappropriately established a new "SWAT" team to swiftly revise an earlier 2000 Biological Opinion on the Missouri River rather than allow that opinion to take effect in 2003.

The UCS distorted the facts. The UCS failed to mention several vital facts and mischaracterized subsequent events. First, after its issuance, the terms and conditions of the 2000 Biological Opinion were in effect already. Pursuant to that Biological Opinion, a spring rise in water levels was to occur every three years if reservoir levels were sufficiently high. Due to the prevailing and serious drought conditions, a 2003 water rise would not have occurred under the 2000 Biological Opinion.

Second, the development of an amended Biological Opinion was triggered by the Corps noting new information[5] and submitting new proposed updates to its Master Water Control Manual for the Missouri River. As such, the subsequent consultation process with FWS was mandatory, not discretionary.

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[4] Moreover, without regard to the current court-driven budgetary situation, the number of new species listed as endangered during a particular time period varies over time for numerous reasons, and as such is not an appropriate measure of the success of the Act.

[5] Among this new information was that, since the 2000 Biological Opinion, two of the endangered species population levels had improved significantly: Piping plover numbers had increase 460 percent within the Missouri River basin since 1997, with pair counts now exceeding recovery goals; and the least terns' estimated population of 12,000 exceeded the recovery goal by 5,000 terns, although the goal of 2,100 terns for the Missouri River itself had not been met.

Third, FWS's swift action derived from court mandates imposed on the Corps. Due to various court orders the Corps had an obligation to ensure finalization of its Master Manual and compliance with the Endangered Species Act by Spring 2004. To meet that requirement, the Corp requested consultations with FWS under Section 7 of the ESA in Fall 2003 regarding its proposed management of the river system. In order to allow the Corps time to implement FWS's recommendations by Spring 2004, the FWS had to accelerate the consultations. This resulted in the FWS having 45 days, rather than the usual 135 days, to complete the 2003 amended Biological Opinion. To meet this accelerated timeframe, a team of 15 Fish and Wildlife Service experts (including seven from the 2000 team) with a collective 300 years of experience was assembled.

Fourth, the 2003 amended Biological Opinion on the Corps' new management proposal determined that jeopardy still existed for one of the three species that were in jeopardy under the 2000 Biological Opinion (the pallid sturgeon), and included specific biological and habitat development targets that must be met to protect all three species. The 2003 amended Biological Opinion thus presented a new reasonable and prudent alternative that includes a number of steps the Corps must take, which not only built on measures recommended in a National Academy of Sciences' review of the 2000 Biological Opinion, but also included the vast majority of the measures included in the 2000 Biological Opinion.

Finally, it is important to note that this team operated independently and reached a consensus biological opinion based upon the best and latest scientific information available. In fact, in an unsolicited and unprecedented action, the two career federal officials leading the process noted in their cover memorandum transmitting the 2003 amended Biological Opinion, that the 2003 amended Biological Opinion process followed a mandate to go "where the science leads us."

They noted they had not been contacted by their superiors, and that they were unhindered in pursuing a project with "only one focus: the pursuit of science and the well-being of the species."[6]

The UCS' claims on "Manipulating the Scientific Process on Forest Management"

- The UCS claims that the USDA manipulated the scientific process on forest management, and used a "Review Team" made up primarily of non-scientists to "overrule" an existing forest management plan.

This claim is false. This case actually highlights how aggressive the Administration has been in using input from the scientific community to inform its forest management decisions. The UCS claim demonstrates a lack of understanding of the NEPA processes used to update the Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision. In fact, the Forest Service received over 200 appeals of the SNFPA and had to review and respond to them. To address these appeals, the Regional Forester (Region Five—California) established the five-person Review Team to evaluate any needed changes to the SNFPA Record of Decision. One scientist provided scientific support to this team. Once the Review Team completed its work, a Draft Supplemental EIS (DSEIS) was completed. This was developed using an interdisciplinary team of 31 people, which included four individuals with Ph.D.s and nine additional individuals with Master's degrees in scientific fields.

A Science Consistency Review (SCR) was conducted to assess the DSEIS from a scientific perspective. The Forest Service uses the SCR process infrequently and only when the additional level of thoroughness is judged necessary to ensure that decisions are consistent with the best available science. Controversy is not a consideration in the SCR process. The SCR is accomplished by judging whether scientific information of appropriate content, rigor, and applicability has been considered, evaluated, and synthesized in the draft documents that underlie and implement land management decisions. This SCR included 13 members, with 11 being scientists, nine external to the Forest Service and seven of these external to the government, including those from universities, the Nature Conservancy, and an independent firm. The results of the SCR were provided to a group of Forest Service professionals (including those experienced in NEPA, science, writing, and resource management) who prepared the final NEPA documents.

It would be highly unusual for all SCR comments to be reflected in the final NEPA documents, since these are prepared in the face of significant scientific uncertainty and a diversity of values. Nevertheless, the draft documents, the science consistency review, the response to the science consistency review, the responses to public comments, and the final SEIS are all available on the web so that scientific

[6] Memorandum to the Assistant Secretary for Fish, Wildlife and Parks, from the Directors of the Great Lakes-Big Rivers Region and the Southwest Region (December 17, 2003).

information used and the process that utilized this information is transparent. How uncertainty and risk are handled in the decision have both scientific and policy elements. In addition, a paper discussing the risk and uncertainty issues around the decision was developed by four additional university scientists. These documents are all available at http://www.fs.fed.us/r5/snfpa/.

The UCS' claims on "OMB Rulemaking on 'Peer Review'"

- The UCS claims that OMB has proposed a "rulemaking" on peer review that would centralize control of review of scientific information within the Administration, prohibit most scientists who receive funding from government agencies from serving as peer reviewers and "have dramatic effects" upon the promulgation of new government regulations, "even though OMB fails to identify any inherent flaws in the review processes now being used at these agencies."

This UCS claim is wrong on many levels. First, OMB did not propose a new government-wide rule, but rather proposed a new Bulletin or guidance document under the Information Quality Act (IQA) and other authorities. To improve its proposed peer review Bulletin, OMB established a 90-day public comment period, which ended December 15, 2003. OMB received 187 public comments, all of which are available on OMB's website. OMB also sought broad input on its proposal by commissioning an open workshop at the National Academy of Sciences to discuss its draft. OMB is now in the process of revising the Bulletin based on the comments received. It should be noted that while such entities as the National Academy of Sciences, the American Association for the Advancement of Science, the Association of American Medical Colleges, the Federation of American Scientists, the American Chemistry Council, the Center for Regulatory Effectiveness, and the National Resources Defense Council all submitted comments, the Union of Concerned Scientists did not.

Second, the proposed Bulletin did not prohibit most scientists who receive funding from government agencies from serving as peer reviewers, nor would it exclude those who are most qualified. While the draft Bulletin cites government research funds as one factor that agencies should consider when determining which scientists should be selected, the listed factors are those "relevant to" the decision, not criteria that automatically exclude participation. Moreover, the proposed Bulletin noted in a variety of places that concerns also exist about potential conflicts of interest for those affiliated with the regulated community. OMB specifically asked for comments on how members of peer review panels should be selected, and will address these comments in crafting the final bulletin.

Third, OMB explained the reasons for its proposal: OMB was (1) responding to a new statutory requirement (the IQA) to improve the quality of information produced by agencies; (2) seeking to improve the Federal Government's practice of peer review so that it is applied consistently across the Executive Branch to ensure the highest quality scientific information possible; and (3) seeking greater transparency of the peer review process.

Fourth, the proposed OMB Bulletin's peer review requirements should not slow down agency regulatory proceedings. A well-conducted peer review process can accelerate the rulemaking process by reducing controversy and protecting any resultant rules against legal and political attack. When done in an open, transparent manner, independent peer review improves both the quality of science disseminated and the public's confidence in the integrity of science.

Finally, the UCS description of the proposed Bulletin concludes with a quote from the Pharmaceutical Research Manufacturers of America (PhRMA) that implies that PhRMA thinks the Bulletin would contribute little value and lead to obstruction and delay. This quote is taken completely out of context. The PhRMA letter applauds OMB for its proposed Bulletin, and discusses how OMB's proposed procedures are already being effectively incorporated into many of FDA's regulatory activities. It concludes that the terms of OMB's proposed Bulletin, especially its exemption for adjudications, is good policy. The quoted sentence is used to articulate why OMB should not change the proposed Bulletin's exemption for adjudications.

II. THE UCS' CLAIM OF "UNDERMINING THE QUALITY AND INTEGRITY OF THE APPOINTMENT PROCESS"

Suggestions of a political litmus test for membership on technical advisory panels are contradicted by numerous cases of Democrats appointed to panels at all levels, including Presidentially appointed panels such as the President's Information Technology Advisory Council, the National Science Board, and the nominating panel for the President's Committee on the National Medal of Science.

It is unfortunate that the Union of Concerned Scientists would attack specific individuals who have agreed to serve their country. Every individual who serves on one of these committees undergoes extensive review, background checks, and is recognized by peers for their contributions and expertise. Panels are viewed from a broad perspective to ensure diversity; this may include gender, ethnicity, professional affiliations, geographical location, and perspectives.

To put this issue in perspective, note that this Administration has over 600 scientific advisory committees. HHS alone has 258 advisory committees. The UCS accusations involve instances explained below, representing rare events among a large number of panels.

The UCS' claims on "Industry Influence on Lead Poisoning Prevention Panel"

- The UCS claims that industry influence on the lead poisoning prevention panel led to interference with an action to toughen the lead poisoning standard. The UCS also takes issue with the HHS Office of the Secretary appointing individuals for the Advisory Committee, rather than making the appointments at a lower level.

This claim distorts deliberations on the complex issue of lead poisoning. First, there was no link between appointments and consideration of toughening the guidelines. The appointments were made in October 2002 and the subcommittee work group was not considering the lead poisoning guidelines at that time. In October 2003, a subcommittee work group of the Childhood Lead Advisory Committee reported its review of scientific evidence to determine whether there was sufficient evidence of adverse health effects on children with blood lead levels less than 10 micrograms per deciliter of blood.[7] The work group had ongoing discussions with CDC about its work, which indicated that while there are adverse health effects in children at blood lead levels less than 10 micrograms, the possibility of confounding by other factors leaves some uncertainty as to the size of the effect. These discussions led to the conclusion that more emphasis needed to be placed on primary prevention. This conclusion was reached for a variety of reasons, including: (1) there are no clinical interventions (treatments) to reduce blood lead levels that are in the range of 1–10 micrograms;[8] (2) it is extremely hard to classify sources of exposure for lead poisoning at blood lead levels below 10 micrograms;[9] (3) error rates in lab testing make it extremely difficult to classify a blood lead level below 10 micrograms;[10] and (4) there is no evidence of a threshold below which adverse effects are not experienced. Thus, there was a renewed emphasis on preventing children's exposure to lead in the first place while continuing the critical work of identifying and intervening on behalf of children with higher blood lead levels.

For all of these reasons CDC concluded that it did not make sense to change the guidelines. CDC advised that studies provide a strong rationale to emphasize preventing exposure of children to lead. The two essential elements are focusing on systematic reduction of lead paint in housing and restricting or eliminating non-essential uses of lead paint in toys, eating and drinking utensils, cosmetics, etc. Eleven of the twelve Advisory Committee members were receptive to CDC's recommended approach.

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[7] In 1991, the federal standard for lead poisoning was set at 10 micrograms per deciliter of blood.

[8] There are no clinical interventions to reduce blood lead levels that are in the range of 1–10 micrograms. No drugs or other methods have been identified that either lower the blood lead levels for children to the levels in the range under discussion (1–10 micrograms) or reduce the risk for adverse developmental effects. Should a child have an elevated blood lead level, a lead inspection would be conducted to determine the source of lead including looking at paint, soil, and house dust. Should these sources result in negative readings, other sources would then be reviewed with the ultimate goal of removing as much of the source as possible. For a blood lead level of 45 micrograms or higher, chelation therapy would be used to reduce, as much as possible, the lead level in the blood and tissue. At a level of 15–45 micrograms, the course of action would be to remove external sources of lead such as lead paint. At a level below 15 micrograms, the course of action would be to educate parents or caregivers about hazards and how to reduce access to hazards. But there are no good methods to intervene and bring a blood lead level of, for example, eight micrograms down to four micrograms.

[9] Sources of exposure for lead poisoning are very difficult to determine at a blood lead level below 10 micrograms. The higher the blood lead level, the easier it is to find the source or sources during a lead inspection. But at blood lead levels below 10 micrograms, the source or sources can be virtually impossible to determine because multiple sources can contribute and each source is additive.

[10] As with all lab tests, there is a certain amount of random error that is unavoidable. In blood lead testing, the typical error rate is + or - 2 micrograms. At a very high blood lead level, this error rate is not of great consequence but at a low blood lead level, the error rate is too great to ensure that children are properly classified.

Regarding the suggestion that two appointees had ties to the industry, every candidate is put through a rigorous ethics process that includes a conflicts of interest analysis. All of the appointments on the Childhood Lead Advisory Committee were cleared through this process.

Regarding the issue of appointment of advisory committee members, the members in question replaced outgoing members who had served several terms and others had permissibly served beyond the expiration of their present terms. Therefore, it was part of the normal advisory committee process to identify new members.

Under the HHS General Administration Manual, the Secretary of HHS is required to approve the appointment of Federal Advisory Committee members except those members who are appointed by the President. CDC and the Office of the Secretary worked to find a balanced slate of individuals to serve on the Childhood Lead Advisory Committee who would reflect a diverse set of opinions, including those from industry, and produce a comprehensive and thoughtful discussion in service of the public's health.

The UCS' claims on "Political Litmus Tests on Workplace Safety"

- The UCS claims that "circumstances strongly indicate a politically motivated intervention" for dismissing three experts on ergonomics from a narrowly focused peer review panel at the National Institute for Occupational Safety and Health (NIOSH), implying that at least two were removed because of their support for a workplace ergonomics standard. Another prospective member of the study section charged publicly that someone from Secretary Thompson's staff, while vetting her nomination, had asked politically motivated questions such as whether she would be an advocate on ergonomic issues.

The claim of politically motivated intervention is not true. In contrast to the NIH, where emphasis panels, peer review groups, and study sections do not come under the purview of Secretarial oversight, CDC's study sections are appropriately under the review of the Office of the Secretary. Agencies typically review many individuals to serve on advisory panels and they may be rejected for a variety of reasons. In this instance, one of the scientists that the UCS mentions was actually selected to be appointed to the committee.

The UCS' claims on "Non-Scientist in Senior Advisory Role to the President"

- The UCS asserts that Richard M. Russell is not qualified by his experience to serve in a senior scientific capacity as a Deputy Director of OSTP.

The notion that Richard Russell's policy experience is insufficient for him to lead the Technology Policy division at OSTP is one of the most offensive statements contained in the UCS document. Mr. Russell's policy experience is as strong, if not stronger, than many of his predecessors. He has worked in both the U.S. House of Representatives and in the United States Senate and for two Committees of the House of Representatives. Most recently, Richard Russell served on the House Science Committee. He not only was a professional staff member, as the report states, but was also Staff Director of the Technology Subcommittee and then Deputy Chief of Staff for the full Committee.

Senior positions within OSTP are defined by the Director, who, in this Administration, has significantly reorganized the office to strengthen coordination with other relevant policy offices and congressional committees. Mr. Russell possesses superior qualifications for the functions he performs in this organization.

The American Association of Engineering Societies (AAES), the umbrella organization for Engineering Societies which represents over one million engineers, endorsed Mr. Russell's candidacy. In a letter to the Chairman and Ranking Member of the Senate Committee on Commerce, Science, and Transportation's Subcommittee on Science, Technology, and Space the Chairman of AAES wrote: "Mr. Russell's experience on Capitol Hill and his strong understanding of federal science and technology policy make him well suited to lead the Technology Division of OSTP.. . .We are very pleased with Mr. Russell's nomination, because his professional accomplishments indicate that he appreciates the important role federal research policy can play in the economic and national security of our nation." The Senate concurred with AAES' assessment and confirmed Mr. Russell by unanimous consent.

The UCS' claims on "Underqualified Candidates in Health Advisory Roles"

- The UCS claims that the Administration's candidates for health advisory roles "have so lacked qualifications or held such extreme views that they have caused a public outcry." Two cases cited are the appointment of Dr. W. David Hager to the U.S. Food and Drug Administration's (FDA) Reproductive

Health Advisory Committee, and the appointment of Dr. Joseph McIlhaney to the Presidential Advisory Council on HIV/AIDS.

This accusation is offensive and wrong. Both the individuals cited by the UCS are in fact well qualified. Their CV's are widely available and it is not necessary to repeat them here.

The UCS' claims on Litmus Tests for Scientific Appointees

- The UCS asserts that a political litmus test was the reason why Dr. William Miller was denied an appointment on the National Institute for Drug Abuse (NIDA) advisory panel.

This claim is false. The HHS Office of the Secretary recommended that Dr. Miller be considered for this panel and NIDA did not concur. The decision by NIDA/NIH was not based on any conversations with any members of the Secretary's Office.

- The UCS document suggests that a nominee to the Army Science Board was rejected because he had contributed to the presidential campaign of Senator John McCain.

This contention is without support. Nominees for standing membership are approved at several levels within the Army and the Office of the Secretary of Defense, and some may be turned down during this process for various reasons. Some may later be reevaluated and included, depending on the current composition of the Board (with a goal to achieve a wide variety of expertise and balance between experienced Board members and new voices). Mr. Howard, the individual identified by the UCS, has expertise relevant to defense issues, and his technical advice has been sought on Army Science Board, Air Force Science Advisory Board, and Defense Science Board studies as a consultant during the current Administration.

The UCS' claims on Dismissal of Nuclear Weapons and Arms Control Panels

- The UCS document suggests that the Nuclear Weapons and Arms Control Panels of the National Nuclear Security Administration (NNSA) were "summarily abolished."

This contention distorts the facts. The NNSA Advisory Committee was established in June 2001, not by Congress, but by the Department of Energy to advise the NNSA Administrator on a wide range of issues affecting the newly established NNSA, including technology, policy, and operations, not just science. As is the case with most advisory committees, the NNSA committee was established for a period not to exceed two years. The charter expired in June of 2003 and was not renewed. The committee had fulfilled its mission. The expiration of the Advisory Committee's charter does not preclude the NNSA Administrator from initiating other advisory groups when warranted. NNSA gets input from the U.S. Strategic Command Strategic Advisory Group, the Defense Science Board, the Secretary of Energy Advisory Board, and the National Academy of Sciences. The NNSA has always had ample independent oversight and analysis requested by DOE or Congress. The Advisory Committee had no oversight responsibilities.

- The UCS document claims that the arms control panel that advised the State Department on technical matters was dismissed, and that a promised new committee to take its place has not been formed.

The Arms Control and Nonproliferation Advisory Group had reached the end of its two-year charter (as set forth in the Federal Advisory Committee Act (5 U.S.C. Appendix 2)), as is the case with most advisory committees. In order to be reconstituted, the charter and composition was examined for any required revision (cf. Section 14 of FACA).

The Arms Control and Nonproliferation Advisory Group has been reauthorized by Under Secretary of State for Management Grant Green as of November 2003. The specific membership is currently under consideration.

III. THE UCS' CLAIMS OF "AN UNPRECEDENTED PATTERN OF BEHAVIOR"

The UCS' claims on "Disseminating Research from Federal Agencies"

Part III closes the UCS "investigation" and contains two sections—one on "Disseminating Research from Federal Agencies" and one on "Irregularities in Appointments to Scientific Advisory Panels." Here, the UCS does not provide a single instance of an actual suppression of agency research or an appointment irregularity

occurring. Both sections consist entirely of quotations from various individuals and one organization.

Individual opinions are not actual events with facts that can be determined. With no context, one must assume these opinions are based upon the type of misinformation presented throughout the UCS document.

The stated opinions do not reflect the views of many outstanding scientists who have worked with this Administration. In particular, the National Academy of Sciences has been closely involved in various aspects of the Bush Administration's science policies. The Academy of Sciences has graciously accepted numerous requests to conduct research program reviews, and have gained first-hand knowledge of the Administration's commitment to independent scientific advice, a commitment that extends to all areas of science under federal support. The most prominent example is the National Academy's review of the Climate Change Science Program's recently released Strategic Plan. If there has ever been an area of contention about this Administration's commitment to science, climate change science is it. Yet the Academy says about the Strategic Plan that:

> "The Strategic Plan for the U.S. Climate Change Science Program articulates a guiding vision, is appropriately ambitious, and is broad in scope. It encompasses activities related to areas of long-standing importance, together with new or enhanced cross-disciplinary efforts. It appropriately plans for close integration with the complementary Climate Change Technology Program. The CCSP has responded constructively to the National Academies review and other community input in revising the strategic plan. In fact, the approaches taken by the CCSP to receive and respond to comments from a large and broad group of scientists and stakeholders, including a two-stage independent review of the plan, set a high standard for government research programs. As a result, the revised strategic plan is much improved over its November 2002 draft, and now includes the elements of a strategic management framework that could permit it to effectively guide research on climate and associated global changes over the next decades.. . .Advancing science on all fronts identified by the program will be of vital importance to the Nation."

ANSWERS TO POST-HEARING QUESTIONS

Responses by Arden Bement, Jr., Acting Director, National Science Foundation

Questions submitted by Chairman Sherwood Boehlert

NATIONAL ACADEMY OF SCIENCES REPORT ON NSF PRIORITY SETTING FOR MAJOR RESEARCH FACILITIES

Q1. What actions does the Foundation plan to take in response to the recent report from the National Academy of Sciences calling for a more open process for selecting and prioritizing major facilities projects supported by NSF?

A1. NSF embraces the goals of the National Academies report, which are to promote greater transparency of the process by which large facility projects are selected, and to apply uniform principles to their management and oversight. The Foundation recognizes the importance of promoting this transparency by articulating a selection process that is clearly defined and easily understood by the research community and the Congress. A number of internal discussions within NSF, and thoughtful interactions with the NSB, have already taken place as we consider how best to achieve these goals. This dialogue will continue at the May and August NSB meetings with a goal of implementing recommendations in early Fall.

Q2. Will NSF develop a roadmap for major facilities, as called for in the report and similar to the one developed this year by the Department of Energy?

A2. I believe we will develop a road map, but it will be a roadmap with NSF characteristics and will have features that are somewhat different from those of mission-oriented agencies. NSF supports research in nearly every field of science and engineering, and that enormously diverse community is very likely to change its views regarding what the most important facility requirements are likely to be over the next decade. While NSF can identify, with reasonable certainty, the facilities likely to be required over the next five years or so, it is important for NSF to be able to reconsider and re-prioritize what facilities will be needed over longer time scales. Preserving NSF's flexibility to reconsider this process in light of continually emerging opportunities is critical to promoting and maintaining a forefront research portfolio.

Q3. Also, what plans are underway to establish committees of external and internal experts to provide annual assessments of facility operations?

A3. NSF has employed practices for post-award oversight of large facility projects for a number of years that are very much in accord with the review process recommended in the National Academies report. For example, LIGO (Laser Interferometer Gravitational-Wave Observatory), IceCube, and the joint NSF–DOE participation in the CERN Large Hadron Collider program have all been handled this way. For some other projects that are now underway or are just getting started, this approach is a new paradigm. One of the responsibilities of the recently appointed Deputy Director for Large Facility Projects will be to make sure that these oversight practices are uniformly applied across the NSF.

Q4. Will NSF strengthen the authority of the Deputy Director for Large Facility Projects?

A4. The authority of the Deputy Director for Large Facility Projects to act flows down through the internal NSF chain of command from the NSF Director. During the next few weeks, the Director intends to consider further the appropriate role, authority, scope of responsibilities, and resources required for that position.

SALARIES AND EXPENSES ACCOUNT

Q5. Please provide an explanation of how NSF would use the additional funds proposed for the Salaries and Expenses account.

A5. The additional $75.3 million for the Salaries and Expenses (S&E) Account is associated with NSF's Organizational Excellence (OE) Strategic Goal, a goal that became part of the Foundation's five-year Strategic Plan in September 2003. OE serves as the cornerstone for NSF operations and activities, and is intrinsically linked with NSF's ability to efficiently and effectively achieve its mission-oriented outcome goals (People, Ideas, and Tools).

As NSF's top investment priority for FY 2005, the additional resources for OE will enable the Foundation to address the staffing, human resource, operational and

physical and technological infrastructure challenges created by the growing volume and increased complexity of the workload. In addition, the resources will enable NSF to address the President's Management Agenda, focus on management challenges and reforms identified by OMB or GAO, address issues identified in NSF's annual review of financial and administrative systems as required by the Federal Managers' Financial Integrity Act and by the NSF Office of Inspector General, and implement recommendations stemming from the comprehensive three-year Business Analysis.

The primary areas of focus within the OE request are:

- *Technologies and Tools (+$51.80 million):* Areas of investment include IT security and protection of information and assets, next generation grants management capabilities and services, new Human Capital and Learning Management systems, and ongoing applications and IT infrastructure maintenance and operations. Collectively, these investments will promote the Foundation's ability to deliver world-class customer services, secure its infrastructure, enhance leadership and innovation in e-Government and complement Human Capital initiatives.
- *Human Capital (+$20.94 million):* Areas of investment include a workforce planning system, enhancements in recruiting and retention of employees, an improved performance management system, development of competency-based job families, work life/workplace initiatives, and enhanced education and training opportunities through the NSF Academy. Collectively, these investments will enable the Foundation to attract and retain the highest caliber scientists, engineers, and educators to fulfill its mission, and to ensure that its technical and administrative staff remains innovative and entrepreneurial. An additional 25 FTE are also included in this request to respond to the growing number of proposals, additional administrative responsibilities and to enhance award management and oversight.
- *Business Processes (+$2.56 million):* The area of investment will be the comprehensive multi-year Business Analysis that is crucial to the overall framework for long-term investments in OE. The Analysis will address issues such as alternative, more efficient methods for conducting the proposal review process, developing more formal procedures for managing the technical risk of awards, assessing the contribution of NSF-funded projects to the advancement of science and engineering, and providing a framework for implementing NSF's next generation IT environment. Collectively, the Analysis will provide a roadmap for improvements in NSF's business processes, human capital management, and technology and tools management.

Questions submitted by Representative Bart Gordon

MATH AND SCIENCE PARTNERSHIP

Q1. The NSF budget request proposes termination of the Math and Science Partnership (MSP) program, transfers $80.0 million for MSP close-out funding from EHR to R&RA, and cuts the remaining K–12 science education programs in EHR by an additional $40.0 million.

Should these actions be interpreted as a policy decision by NSF to de-emphasize, or abandon, K–12 STEM education programs, and will we see additional cuts to these programs in future budgets?

A1. The phasing out of the Math and Science Partnership (MSP) program at NSF—and the consolidation of initiative efforts at the Department of Education—reflects the Administration's desire to consolidate resources into a single program for maximum impact. NSF has requested $80 million to honor funding commitments for the existing portfolio of MSP awards in 2005. Administering the funding for MSP in the Integrative Activities portion of the Research and Related Activities Account acknowledges the integrative aspects of the program across NSF.

Neither the phase-out of MSP nor the additional cuts in EHR should be interpreted as a policy decision by NSF to de-emphasize or abandon K–12 science, technology, engineering and mathematics (STEM) education programs, but rather as a set of strategic decisions by NSF to continue its impact on K–12 STEM education within current priorities.

Q2. And if this is not the intention, in light of the evident need to improve K–12 STEM education, what is the rationale for these budget proposals?

A2. Within EHR, efforts will continue to enhance comprehensive K–12 teacher education, to develop high-quality instructional materials, to prepare a new generation of education leaders capable of addressing emerging issues facing STEM education nationally and to facilitate linkages between the informal and formal education communities. Increasing efforts will be placed on conducting educational research in STEM education and aggressively pursuing efforts to effectively disseminate that research to practice. Moreover, complementing EHR efforts are the activities within disciplinary directorates that integrate research and education at the K–12 level, for example, through outreach efforts of the Science and Technology Centers and the Engineering Education Centers.

BROADENING PARTICIPATION

Q3. The NSF budget presentation describes the Human Resource Development activity at NSF as being focused on increasing participation and advancement of under-represented groups and institutions in STEM education.

Since there is wide agreement on the importance of such programs, why does the budget request cut them by seven percent overall and freeze funding for a particularly effective program, the Louis Stokes Alliances for Minority Participation? What is the rationale for these funding decisions, particularly with regard to programs that NSF's own assessments have found to be effective?

A3. Programs supported by the Human Resource Development (HRD) sub-activity are focused on increasing participation and advancement of under-represented groups and institutions in STEM education. The funding requested for HRD is $4.53 million above the Administration's FY 2004 Request, although less than the amount eventually appropriated by Congress. It will provide for continued coordination with the Louis Stokes Alliances for Minority Participation (LSAMP) and the Alliances for Graduate Education and the Professoriate. The Education and Human Resources Directorate has been working to broaden the impact of the LSAMP program (e.g., co-funding of collaborative initiatives between Mathematical and Physical Sciences programs and LSAMP and the summer internship collaboration between Department of Energy and LSAMP). The LSAMP funding level provides for full funding for Cohort I Alliances. Additionally, the FY 2005 Budget Request will provide first year support for at least four new awardees. Thirteen of the 14 STEM doctoral degree granting HBCUs that are eligible for CREST/THRUST awards will have been funded by the end of FY 2004. These 13 HBCUs are not eligible for additional CREST/THRUST awards in FY 2005, but four can compete for supplements from the regular CREST program in FY 2005.

NSF WORKING GROUP ON POSTDOCTORATES

Q4. A response to a written question that Congresswoman Johnson sent to NSF prior to this hearing indicated that one result arising from the efforts of the NSF-wide Working Group on Postdoctorates is the policy for NSF's postdoctorate programs to include support for fringe benefits, especially heath care.

With regard to postdocs who are supported as research personnel under normal research grants, does NSF plan to institute terms and conditions in its grants to regulate the treatment of postdocs in a way that is consistent with NSF's own postdoc programs?

A4. NSF does not have plans "to institute terms and conditions" for the support of postdocs on research grants beyond its current policy. In particular, although subject to external peer and NSF staff review before a grant is awarded, the stipend level and benefits package are developed by the submitting institutions according to their policies and practices. With input from the community, NSF is continuing a review of its policies with respect to financial support of postdocs and mechanisms that improve their career development.

CYBERINFRASTRUCTURE

Q5. The FY 2004 Budget Request included $20.0 million for a new Cyberinfrastructure sub-activity in the computer science directorate.

What has happened to this initiative in the FY 2005 Request?

A5. At the time the FY 2004 Request was being formulated, preliminary discussions among the NSF directorates were underway and the NSF Advisory Committee on Cyberinfrastructure was still in the process of preparing its report. Since that time,

the Advisory Committee for Cyberinfrastructure completed its report, and the agency has consolidated responsibilities for shared cyberinfrastructure within a single division, the CISE Division of Shared Cyberinfrastructure. The $20 million requested as a sub-activity in FY 2004 will be managed in the Division of Shared Cyberinfrastructure; this funding augments $92.6 million available within that division for shared cyberinfrastructure in FY 2004. As indicated in the President's Budget Request, in FY 2005, NSF expects to invest nearly $400 million in cyberinfrastructure across both shared and domain-specific resources. These investments will be made through a wide range of programs and funding modes, providing opportunities for individual institutions to participate.

Q6. What resources are available to individual institutions for upgrading cyberinfrastructure, and what is being developed for shared cyberinfrastructure?

A6. In FY 2005, NSF will continue to take steps toward deploying an enhanced cyberinfrastructure for science and engineering research and education. These steps build on the results of FY 2004 competitions, and draw upon input from the academic community and NSF's programmatic directorates and offices, as well as recommendations from the report of the NSF Advisory Committee on Cyberinfrastructure.

As previously announced, the Partnerships for Advanced Computational Infrastructure (PACI) have been extended through the end of FY 2004. During this period, both PACI lead sites—the National Center for Supercomputing Applications (NCSA) and the San Diego Supercomputer Center (SDSC)—will deploy significant technology upgrades, almost doubling the high-end computing resources that NSF makes available to the Nation's scientists and engineers.

In FY 2005, NSF plans to support the following cyberinfrastructure activities, amongst others:

- Support will be provided for NCSA and SDSC to ensure the continuing provision of high-end supercomputing resources and related services to the national community. In addition, SDSC and NCSA will work in partnership with NSF and the science and engineering community at large to define emerging cyberinfrastructure opportunities to advance all fields. These and other community activities will inform NSF's development of future cyberinfrastructure-enhancing competitions.
- Complementing the cyberinfrastructure resources and services provided by NCSA and SDSC, the Extensible Terascale Facility (ETF)—which is on track to be commissioned October 1, 2004—will demonstrate the potential of revolutionary grid computing approaches to advance science and engineering research and education. Additional ETF upgrades are planned for FY 2004, which includes a new capability computing investment for the Pittsburgh Supercomputing Center (PSC). This upgrade represents the final stage of the ETF's construction phase. Support for the management and operations of ETF-enabled cyberinfrastructure will be provided beginning in FY 2005 and extending through FY 2009.
- To ensure that all science and engineering communities are prepared to inform the development of and effectively utilize the broad, evolving cyberinfrastructure, NSF plans to hold an open competition during FY 2004 that will ultimately support a comprehensive set of education, training and outreach awards. This competition will build on the work of the successful PACI Education, Outreach and Training (EOT) and other activities.
- Support for the NSF Middleware Initiative will ensure the availability of the tools needed to build future generations of distributed systems and applications. Middleware manages interactions among distributed resources, providing usability, robustness, security and other features, while hiding complexity of individual computers. Emphasis for 2005 includes integration of middleware services with domain sciences, and development and prototyping of new middleware functionality and services.
- International Research Network Connections supports the cooperation and collaboration of U.S. based researchers with researchers in other nations by providing access to data, research outputs, and other networked resources; the program also supports connectivity to instruments that are shared across borders. In FY 2005, the program will emphasize solutions that provide the best economies of scale and provide access to the largest communities of scientists, engineers and educators.

Q7. Where does high-end computing, particularly provision for leading edge supercomputers, fit into your cyberinfrastructure plans?

A7. High-end computing remains a priority for NSF. As indicated above, supercomputing is a key component in the cyberinfrastructure and NSF will address support for supercomputing through awards to NCSA, SDSC, and the Extensible Terascale Facility partners (at Pittsburgh Supercomputing Center, NCSA, SDSC, Argonne National Laboratories, the California Institute of Technology, Indiana University, Purdue University, Oak Ridge National Laboratory, and the University of Texas).

Q8. How have the findings and recommendations of the interagency High-End Computing Revitalization Task Force (HEC–RTF) influenced your FY 2005 budget decisions for cyberinfrastructure?

A8. NSF is actively pursuing two of the issues explored by the HEC–RTF. To address software needed for high-end computers, NSF and DARPA have just released an announcement "Software and Tools for High-End Computing" (NSF–04–569) on this topic; NSF will invest $6.0 million and DARPA will invest $1.0 million. This effort also addresses a second issue: collaboration among federal agencies. In addition this joint announcement, NSF also is collaborating with DARPA on their High Productivity Computing Systems program, in which NSF will assist in reviews and co-fund projects.

PLANT GENOME RESEARCH

Q9. The recently enacted NSF authorization law includes an authorization for basic genomic research related to crops grown in the developing world.

Within NSF's proposed plant genome research activities and international programs for FY 2005, what resources are being made available to implement this new budget authority?

A9. To encourage international collaboration on crop plants important to the developing world, the Plant Genome Research Program Announcement soliciting proposals for FY 2004 and FY 2005 includes the following language:

> "NSF encourages international research collaborations, particularly with investigators from developing countries, and especially where there is a common research focus or system."

In FY 2004, the Plant Genome Research Program released a Dear Colleague Letter entitled, "Developing Country Collaborations in Plant Genome Research" (NSF 04–563) to announce the availability of funding to augment existing grants for activities designed to foster research collaborations between U.S. scientists and scientists from the developing world. The focus of the added support would be on research on crops grown in the developing world and/or on traits that are important to crops grown in the developing world. The NSF Office of International Science and Engineering and the U.S. Agency for International Development (USAID) provided substantial input to the Dear Colleague Letter. USAID has agreed to provide assistance to Principal Investigators in identifying potential scientists and institutions in developing countries.

In addition, the Interagency Working Group on Plant Genomes, an NSTC subcommittee involving NSF, USDA, USAID, DOE, OSTP, NASA, and OMB, is discussing an interagency joint program to support research collaboration in plant genomics/biotechnology between U.S. scientists and scientists from the developing world.

Furthermore, database and genomic tools developed through NSF funded research will provide the basis for future international cooperation. The development of tools for rice is an excellent example. These tools can be used to identify genes governing economically important traits such as drought tolerance, flowering time, and disease resistance across a range of rice species, including African cultivars, which are distinct from those grown in Asia.

It should be noted that NSF-supported researchers are already collaborating with institutions in developing countries, utilizing results from previously-funded research. Examples include a collaboration between the group studying a model legume (Medicago) and a group in India studying chickpea, and the group studying Sorghum genomics with groups working on Sorghum in Africa. NSF supported a training workshop on maize in Mexico City that was attended by students and researchers from Africa who received travel support from USAID.

SALARIES AND EXPENSES ACCOUNT

Q10. The FY 2005 budget proposal for the NSF Salaries and Expenses Account includes a request of $84.0 million for information infrastructure acquisitions.

NSF has underway a three-year, $12.0 million review of the agency's business processes and required human capital and enabling technologies. One outcome is to be an integrated enabling technologies plan.

Why does this proposed, substantial budget increase for information infrastructure for internal NSF operations precede the completion of the enabling technologies plan?

A10. The budget increase for information infrastructure for internal NSF operations reflects and is consistent with analysis and products completed to date as part of the Business Analysis, as well as to enhance system security and update an aging infrastructure as part of our normal operations. Information Technology Plan and Enterprise Architecture work being conducted under the agency-wide Business Analysis study is designed to be an iterative process, with periodic analytical and planning products produced frequently. Planning and analysis products are strategic in nature and are focused on the major technology initiatives, architectural components, management principles and technical standards needed to better support NSF business processes. The baseline Enterprise Architecture and the preliminary target Enterprise Architecture, delivered in September 2003, were used to formulate and inform the FY 2005 budget request for IT investment in next generation grants management and human capital systems, and to establish priorities for acquisition of critical supporting infrastructure.

Q11. Why do you believe that the technologies you are seeking to acquire will be consistent with the recommendations from the management study?

A11. The FY 2005 Request reflects an information technology investment roadmap and plan for achieving significant improvements in NSF's business processes that are fully aligned with the preliminary target Enterprise Architecture. NSF is using this roadmap, plan, and preliminary Architecture to tactically plan for, assess, acquire, and implement identified high priority technologies. The Business Analysis recommendations are largely focused on making infrastructural and architectural improvements that will be robust enough to accommodate future technology environments regardless of the exact form of the final target architecture. For example, a high priority recommendation is to transition to an enterprise directory service to provide a mechanism for consolidating and integrating information, improving security, and increasing inter-operability. NSF's FY 2005 Request reflects the priority to acquire and deploy this key architectural element, recognizing that deployment of specific technologies and capabilities will be an ongoing, iterative process within the overall Enterprise Architecture framework. The next iteration of the target Enterprise Architecture and the information technology plan are scheduled for June and September 2004. NSF will continue to plan for and acquire recommended enabling IT infrastructure in alignment with the target Architecture and implementation plan. NSF will also maintain high quality customer service, assure system performance, and improve management and operational efficiency of systems, networks, data center and help desks.

POST-AWARD MANAGEMENT

Q12. The FY 2003 independent auditor's report for NSF found one reportable condition on post-award management. The audit recommended that NSF fully implement post-award grant monitoring policies and procedures specified in the NSF "Award Monitoring and Business Assistance Program Guide."

When will this recommendation be implemented?

A12. NSF's implementation of this recommendation began with development of a Pilot Program in FY 2002 that featured a risk assessment model and a select number of site visits. In FY 2002, nineteen award monitoring and business assistance site visits were conducted.

In FY 2003, from lessons learned, NSF developed a strategic program—Award Monitoring and Business Assistance Program (AMBAP)—that balances risk mitigation and cost-benefit. This program incorporates post-award management monitoring and those complementary end-to-end award management activities that support its effective implementation. This program includes:

- A dynamic risk assessment framework that integrates institutional and award risks. The data elements that describe the risk factors are incorporated into the database, allowing for electronic analysis.
- A site selection process that uses data from the above as a first level of identification. NSF's comprehensive site selection process supplements the outputs

from the implementation of the risk assessment framework, with specific program office referrals and requests; institution-initiated requests; reverse site visits; and audit resolution visits.

- The AMBAP Guide includes: core review areas; preparation protocols; site visit tools; post visit follow-up with NSF program staff and NSF grantees; and reporting and documentation requirements.

The AMBAP Guide is a living document that NSF continues to refine as it gains experience and in which new requirements are incorporated as they are deemed appropriate. For example, in FY 2004 NSF is conducting test work for erroneous payments on high-risk grants as part of NSF's compliance with the Improper Payments Information Act of 2002.

SETTING PRIORITIES FOR LARGE FACILITIES CONSTRUCTION PROJECTS

Q13. A response to a written question Congresswoman Johnson sent to NSF prior to this hearing, regarding the recommendations of the National Research Council on setting priorities for NSF's large facilities construction account, indicated that NSF has reservations about developing a 10–20 year roadmap of prioritized facilities construction projects. The main objection seemed to be that a 20-year timeframe was too long, but implied 10 years may be possible.

Is the time period your main objection to this NRC recommendation? Do you believe it is feasible to develop, say, a 10-year roadmap?

A13. To reiterate some of the points made in answer to question number one, NSF supports the goals of the National Academies study—enhanced transparency of the large facilities selection process, development of well understood budgets that are needed to construct and operate these facilities, and application of the highest standards of oversight to their construction and operation.

NSF has some concerns regarding the rather detailed recommendations for implementation contained within the report. The NSF context for implementing these recommendations is not fully reflected within the report. As mentioned in answer to the first question, the breadth of research supported by NSF makes it difficult to predict the needs of and opportunities for such a varied group of disciplines far in advance. It is possible to do this with good precision at least five years into the future, and maybe even further, because the timescale for development of construction proposals by the academic community is at least that long in most cases. So the timescale is one of the concerns, but there are others.

Another concern we have with the report concerns the rather prescriptive role it defines for the Deputy Director for Large Facility Projects. NSF recognizes the need to strengthen its oversight capabilities during the construction of large facility projects. To address this concern, the agency has created this new position. The intention in doing so was to hire a person to be charged with the responsibility for coordinating with program officers throughout the Foundation to make sure that NSF's policies and guidelines for project oversight are uniformly applied, within the existing organizational framework. NSF feels that it would not be helpful to establish an independent organization to oversee and manage large projects during their construction phases.

Q14. Would NSF be willing to encourage and support efforts by science and engineering disciplines that do not now do so to develop prioritized lists of facilities construction projects in their fields, which NSF could then use to develop a prioritized roadmap across fields?

A14. NSF is very much willing to encourage and support efforts of various research disciplines to articulate their needs for large facilities. The Foundation have long supported these activities in communities that are facility intensive, such as astronomy and particle physics, through workshops, summer studies, and enabling smaller scale research and development grants. More recently, NSF extended this support to other areas as opportunities have arisen, such as ecology, oceanography, and civil engineering, and plan to continue to look for ways to enable disciplines to strategically plan. These inputs are very helpful to NSF, since fundamentally the Foundation reacts to the needs of the research communities it serves to strategically plan for the future. However, many disciplines have not traditionally organized themselves in this way, and it is likely that some will continue to pursue alternative ways to voice their ideas.

NANOSCALE SCIENCE AND ENGINEERING

Q15. The Nanoscale Science and Engineering priority area receives an increase of 20 percent under the FY 2005 NSF budget proposal. However, the breakout of funding by research directorate shows a four percent decrease in funding in the Social, Behavioral and Economic Sciences Directorate, from the already low level of $1.56 million for FY 2004.

Could you explain why research related to the societal implications of nanotechnology appears to be de-emphasized in this budget request?

A15. Research on the societal implications of nanotechnology is an important priority for the Social, Behavioral and Economic Sciences Directorate (SBE) and the National Science Foundation (NSF). SBE and the Foundation anticipate substantial investments in research exploring the societal implications of nanotechnology. The $1.5 million mentioned in the SBE budget reflects the Directorate's formal commitment to the Nanoscale Science and Engineering priority area competitions. This amount does not reflect the full amount that the NSF anticipates will be spent on research on the societal implications of nanotechnology. In particular, it excludes investments that SBE is likely to make through its core program competitions and its contributions to the Human and Social Dynamics (HSD) priority area, as well as work on the societal implications of nanotechnology supported by funds budgeted in other Directorates. While NSF expects additional investments, they cannot be estimated with any precision.

The Engineering Directorate has recently stated that they will be increasing the Directorate's contribution to research in the societal implications of nanotechnology in both FY 2004 and FY 2005. This will bring the minimum research funding in this area to $2.5 million in both years with the ability to increase this level if the quality and quantity of proposals are similar to FY 2003.

Success of Nanotechnology Ad hoc Proposals. The importance of the societal implications of nanotechnology to the research community and to NSF is demonstrated in the submission and competitive, peer reviewed, awarding of significantly more proposals in FY 2003 than originally anticipated. In FY 2003, $1.1 million was budgeted for proposals involving the social, ethical, and other societal implications of nanotechnology. Based on the quality of proposal submissions, NSF funded $3.4 million for proposals in this area. This is over three times the anticipated amount and demonstrates the commitment of the agency and the research community to this important area of social scientific research.

Increased Interest Within the Research Community. Already in FY 2004, NSF has seen increased interest in the societal implications of nanotechnology outside the formal nanotechnology solicitation. Programs in the SBE Directorate have received many proposals to perform research in this area and the Human and Social Dynamics priority area, which SBE coordinates, is stimulating further interest. Researchers have submitted letters of intent to submit proposals in this year's HSD priority area competition with topics such as perspectives of nanotechnology risk, the implications of nanotechnology on society and the economy, and the development of research infrastructure associated with nanoscience and nanotechnology. These and many more will be peer reviewed and will also likely lead to increased funding of the societal implications of nanotechnology beyond the formal SBE commitment to the Nanoscale Science and Engineering solicitation.

Question submitted by Representative Lamar S. Smith

SILICON NANOELECTRONICS AND BEYOND

Q1. In the next 10–15 years the country will reach the physical limits of the semiconductor technology we have used for the past 30 years, and absent a replacement technology, semiconductor driven productivity gains will slow significantly. The NSF has just started a program, called Silicon Nanoelectronics and Beyond, so that we can continue development of replacement technology.

Does NSF have any plans to increase university research under this program to ensure our ability to remain competitive in the semiconductor and nanotechnology markets?

A1. The NSF (Directorates for Engineering; Mathematical and Physical Sciences; and Computer and Information Science and Engineering) and the Semiconductor Research Corporation (SRC), through a Memorandum of Understanding, have developed a partnership in Silicon Nanoelectronics and Beyond (SNB) to work together in developing the fundamental research base and creation of new knowledge needed

to sustain the U.S. leadership and competitiveness in the global semiconductor industry. The SNB joint activity will seek to provide expanded and possibly collaborative support for research needs identified in the International Technology Roadmap for Semiconductors (ITRS) and in the integration of biological, molecular, and other emerging areas of electronics at the nanoscale.

NSF is providing opportunities for U.S. academic researchers to submit proposals in SNB within the NSF-wide Nanoscale Science and Engineering (NS&E) competition, which is conducted annually as part of NSF's investment in its priority area of Nanoscale Science and Engineering. The NS&E competitions provide support for centers, interdisciplinary research groups, and exploratory research by individual investigators. Individual investigators may also submit unsolicited proposals in SNB to NSF core program areas.

The current FY 2004 Nanoscale Science and Engineering solicitation has added specific language identifying opportunities in SNB under the research area Nanoscale Devices and System Architecture. Beginning in FY 2005, and in subsequent years, the NS&E solicitation will include a separate section describing research opportunities in SNB. NSF and SRC will jointly define and conduct the SNB portion of the FY 2005 NS&E competition, in accord with established NSF procedures. NSF"s investment in SNB is expected to grow in FY 2005 and FY 2006 as the community of SNB researchers becomes energized and the number and quality of SNB proposals grow. The magnitude of future investments by NSF will depend critically on the budget allocations available to this research area.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Charles E. McQueary, Under Secretary for Science and Technology, Department of Homeland Security

Questions submitted by Chairman Sherwood Boehlert

Q1. For the current fiscal year, please provide a breakdown of how funds have been allocated among Department of Energy laboratories, universities, and private industry. Also, in the current fiscal year, how much funding will be allocated to the Homeland Security Advanced Research Projects Agency?

A1. For the current fiscal year, $146.0 million has been allocated to the Department of Energy (DOE) DOE National Laboratories and sites, $69.6 million has been allocated to the University Programs/Homeland Security Fellowships, and $483.8 million to private industry. The Homeland Security Advanced Research Projects Agency (HSARPA) has been allocated a total of $246.5 million.

Q2. In the fiscal year 2004 appropriations report for DHS, Congress instructed the Department to consolidate all research and development funding within the Science and Technology Directorate in the fiscal year 2005 budget request. This has not happened—for example, the budget request explicitly includes $154 million for research and development activities in the Transportation Security Administration (TSA).

Q2a. Please describe the DHS research and development activities, including those at TSA, that have not been transferred into the S&T Directorate.

Q2b. What is the schedule for transferring these activities to the S&T Directorate?

Q2c. How is your Directorate overseeing and coordinating these programs in the meantime?

A2a,b,c. The Science and Technology (S&T) Directorate will establish management relationships regarding research and development (R&D) activities in the Department of Homeland Security (DHS) with the following:

- Transportation Security Laboratory (Border and Transportation Security Directorate, Transportation Security Administration);
- Customs Applied Technology Division (Border and Transportation Security Directorate, U.S. Customs and Border Protection);
- Customs Laboratory System's Laboratories & Scientific Services Research Facility (Border and Transportation Security Directorate, Bureau of Customs and Border Protection); and
- Immigration and Naturalization Service (INS) Forensic Document Laboratory (Border and Transportation Security Directorate, Bureau of Immigration and Customs Enforcement).
- In addition, S&T will establish management relationships with the U.S. Coast Guard R&D Center and with U.S. Secret Service Laboratory R&D activities that will take into consideration the traditional and protective missions respectively of these entities.

Details of actions and timelines required to establish new management relationships and integrate R&D activities in the Department will be finalized by the Secretary.

We will complete the administrative requirements to establish management relationships between R&D activities in other DHS components and S&T by September 30, 2004. Our intent is to develop and expand collaborative relationships as the new management relationships are established. To establish these management relationships, the S&T Directorate expects to take the following steps:

- The proposed management relationship between S&T and each R&D activity will be determined;
- Memoranda of Agreement will be promulgated between S&T and each R&D activity; and
- Mutually agreed-to transition plans will be developed.

S&T staff have collaborated as appropriate with R&D-related activities located in DHS elements external to the S&T Directorate. The formation of official management relationships between the S&T Directorate and each R&D activity in the Department will identify responsibilities for coordination and oversight of R&D activities as appropriate.

Q3. The fiscal year 2005 budget request proposes that the DHS Science and Technology Directorate's University Programs be decreased from $69 million in fiscal year 2004 to $30 million in fiscal year 2005. How would this cut affect your continuing and future programs, such as the university centers of excellence and the fellowships for students in homeland security-related fields?

A3. Maintaining a cadre of talented scientists and engineers and investing in our future scientific workforce is a top priority of the Department. DHS will maintain this core program, but will not be able to expand the Scholars/Fellows program to include fellowships for post-docs and faculty at the reduced funding level. The reduced funding may also impact the internship component of the Fellowship program in the summer of 2005.

To date, DHS has established three university-based Homeland Security Centers of Excellence (HS Centers), the University of Southern California's Homeland Security Center for Risk-Based and Economic Analysis of Terrorist Events. Two more HS Centers in the area of agricultural security—foreign animal and zoonotic disease defense, and post-harvest food protection and defense—were recently chosen at Texas A&M University and the University of Minnesota respectively.

DHS has solicited input from the National Academies of Science to determine appropriate topics and prioritized areas for future HS Centers. DHS expects to release solicitations and award two additional HS Centers in FY 2004 for a total of five HS Centers. The reduced funding level for the University Programs will not impact the initial three-year funding for each HS Center established.

Q4. How is your Directorate working to transfer technology to the operational portions of the Department? Please provide an example of a technology that has been successfully transferred to another unit or to industry, or plans to transfer one of your nearly mature technologies.

A4. The S&T Directorate's primary focus is on applied research and development, improving technologies, and deploying them to emergency responders and end-users as rapidly as possible. Several of the primary end-user communities (e.g., Secret Service, Coast Guard, Border and Transportation Security, and Emergency Preparedness and Response) are represented in the S&T Directorate by Portfolio Managers. These Portfolio Managers lead the S&T planning and budgeting effort relating to end-user organizations. Additionally, S&T staff works within the Information Analysis & Infrastructure Protection Directorate (IAIP) to facilitate the development and communication of requirements. In addition, by emphasizing a systems engineering approach to technology development, end-user needs and life cycle considerations such as affordability, manufacturability, inter-operability, ease of use and sustainability are embedded at the beginning of the development effort.

Examples of technologies successfully transferred or demonstrated by S&T to operational components or industry include:

- PROTECT: a chemical detection and response capability now deployed in the Washington Metro System. This system is being operated and expanded by the Washington Area Metropolitan Authority.
- LINC: provided the tools and know-how to several U.S. Municipalities to facilitate on-site response and decision-making if a nuclear, biological and chemical atmospheric release were to occur and to link those cities with the National Atmospheric Release Advisory Center if a more sophisticated analysis is required.
- Audio matrix switches: installed in strategic radio communication locations in the Washington, D.C., metropolitan area, to improve inter-operability in the Metropolitan Inter-operability Radio System. This program demonstrates inter-operability in a dense urban area through the use of multi-band audio switches in multiple locations and jurisdictions.
- Dual Zone Maritime Inter-operability Solution: implemented in the New Orleans/Baton Rouge, LA, region, which improves regional inter-operability along the Mississippi River using audio matrix switches to connect radios operating on disparate systems.
- Radio Infrastructure Inter-operability Planning Tool (RIIPT): assesses coverage, technology, and inter-operability across government agencies. It is being used to analyze federal agencies along the United States northern border for the Integrated Border Enforcement Team (IBET) to identify coverage deficiencies and overlaps, and to recommend inter-operability improvements.
- Unmanned Aerial Vehicles (UAVs): demonstrated in an operational environment, as part of the Arizona Border Control Initiative/Border and Transportation Security (BTS) Directorate.

- Threat Vulnerability Mapper (TVM): enables the geospatial depiction of terrorist threats against the nationwide infrastructure vulnerabilities. It has been delivered and successfully integrated within the Information Analysis and Infrastructure Protection (IAIP) Directorate.
- BorderSafe: an information sharing capability that allows state and local law enforcement agencies to share relevant information on investigations and includes specific U.S. Customs and Border Patrol (CBP) data that furthers investigation of potential terrorist activities. BorderSafe currently operates in Arizona and California.

Examples of technologies that are nearly mature and will soon be transferred:

- Micro-Chem Lab: a portable capillary electrophoresis analysis tool to conduct on-site characterizations of biotoxins, bacterial and viral threat agents. The S&T Directorate is now entering into a cooperative R&D agreement with a commercial partner.
- Autonomous Pathogen Detection System (APDS): a field-deployable system that performs automated on-board analysis of a dozen or more threat agents on a 24/7 basis and communicates any positive results via wireless communications. System research and development will be completed in 2004. The S&T Directorate is now entering into a cooperative R&D agreement with a commercial partner. The APDS will be demonstrated in the field in partnership with New York City for upcoming special events.
- Counter-MANPADS: The Department of Homeland Security (DHS) initiated an aggressive two-phase System Design and Development (SD&D) program for antimissile devices for commercial aircraft. This program intends to migrate existing the Department of Defense (DOD) missile warning and countermeasure technologies to the commercial airline industry, rather than developing new technologies. This re-engineering project will ensure that the resulting countermeasure systems are consistent with commercial air carrier and airport operations, maintenance, support, and logistics activities. The program seeks to balance cost, schedule, and performance and to clarify the needs and requirements of the aviation community stakeholders. It will provide the data and analysis needed by the Administration and Congress to make an informed decision on deployment and implementation.

Questions submitted by Representative Bart Gordon

Q1. **Biological Counter-Measures—***The most significant increase in the Directorate's budget is requested for biological countermeasures, particularly in the area of detection and assay. What does the Directorate expect to accomplish if these increases are approved?*

Q1a. To what extent are the detection networks under development capable of identifying the full spectrum of biological threats?

A1a. The currently deployed Phase 1 BioWatch system detects six of the top threats—both bacterial and viral. Advanced detection systems, now under development, should allow us to cost-effectively expand detection capability to more than 20 threat agents (including markers for antibiotic resistance and engineered organisms) by FY 2009. A reasonable expansion in the suite of threat agents detected is likely before that time. The scope of these potential additions will be decided on the basis of threat information, integration costs and operational considerations.

Q1b. The efforts to detect and counter other threats (chemical, explosive or radiation) do not receive equivalent increases. What explains the disparity in how the Directorate is focusing its resources?

A1b. Resource allocation in the Directorate is based on a comprehensive review of the threat, vulnerabilities to the threat, catastrophic magnitude of a potential event, national capacity to respond, and other factors. This review is married with current national policy directives to provide a balanced investment portfolio to counter the threats of Weapons of Mass Destruction (WMD). The biological countermeasures area has received increased emphasis based on this approach.

In addition, the Homeland Security Council (HSC) and National Security Council (NSC) recently completed a Biodefense End-to-End study. This study resulted in a National Biodefense Strategy, to be promulgated in a joint National Security Presidential Directive/Homeland Security Presidential Directive (NSPD/HSPD) in April 2004. One of the major recommendations of this study was the need for an integrated biosurveillance system which would integrate information on the health of

our Nation's population, livestock, and plants with environmental monitoring data on our cities, food, and water supplies, along with threat and intelligence information. This integrated data will provide a continuing situational awareness, early detection of potential events, and early characterization of the extent of any attack.

Because of the very high leverage that such an integrated biosurveillance system has on the rest of the biodefense system, the administration highlighted a coordinated, interagency, biosurveillance initiative in its FY 2005 budget submittal. Expanding the current, successful, BioWatch system and developing the next generation of detection technologies to further increase the capability, coverage, and monitoring frequency of a next generation BioWatch system figures prominently in this interagency initiative. A similar, joint NSC–HSC, "end-to-end" study is now underway for Chemical Defense and it is reasonable to expect that this study will also identify key initiatives critical to improving the Nation's chemical defense.

Q2. **University Fellowship Cuts—***Of all the areas in the Department's R&D budget request, there is one that stands out as a significant loser: the University and Fellowship Program. It is reduced from $68.8 million to $30 million.*

Q2a. Given the Directorate's expressed interest in "ensur[ing] a diverse and highly talented science and technology community to achieve the DHS mission and objectives," how does reducing funding by more than half achieve your purpose?

A2a. Maintaining a cadre of talented scientists and engineers and investing in our future scientific workforce is a top priority of the Department. At the reduced funding level, DHS will maintain this core program, but will not expand the Scholars/Fellows program to include fellowships for post-docs and faculty.

To date, DHS has established three university-based Homeland Security Center of Excellence (HS Centers), the University of Southern California's Homeland Security Center for Risk-Based and Economic Analysis of Terrorist Events. Two more HS Centers in the area of agricultural security—foreign animal and zoonotic disease defense, and post-harvest food protection and defense—were recently awarded to Texas A&M University and the University of Minnesota respectively.

DHS has solicited input from the National Academies of Science to determine appropriate topics and prioritized areas for future HS Centers. DHS expects to release solicitations and award two more HS Centers in FY 2004.

Q2b. The Department funded 100 undergraduate scholarships and graduate fellowships in FY 2003. A new competition is currently underway. Are you confident the Department will be able to fulfill its commitment to these students, and will this reduction reduce the number of awards available for the 2005 competition?

A2b. Yes, the Department of Homeland Security will maintain the core program of Scholars and Fellows.

Q2c. Is the funding for University Centers of Excellence drawn from these funds? If so, how does this affect the Department's current plan for establishing and supporting these Centers?

A2c. The funding for the University Centers of Excellence comes from the same funds as the Fellows and Scholars program. As previously discussed, DHS has awarded three university-based homeland security Centers of Excellence. DHS expects to release solicitations and award two more HS Centers in FY 2004. The reduced funding level for the University Programs will not impact the initial three-year funding for each HS Center established.

Q3. **USC Center—***Last November, the University of Southern California was designated the first Homeland Security Center of Excellence. The Center, according to the Department, "will address both the targets and means of terrorism, with emphasis on protecting the Nation's critical infrastructure systems, such as electrical power, transportation and telecommunications. In addition, the HS Center will develop tools for planning responses to emergencies, to minimize the threat to human lives and reduce the economic impact in the event of an attack."*

Q3a. What are the products the Department expects to receive from its investment in the Center, and what is the anticipated schedule for delivery?

A3a. The University of Southern California Homeland Security Center for Risk and Economic Analysis of Terrorism Events will serve the national interests by providing tools and guidance to the Department of Homeland Security for the prioritization of counter-measures to terrorist threats, identifying areas where investments are likely to be most effective, computing relative risks among potential terrorist events, and modeling and estimating the social consequences of terrorism.

More specifically, the Center and its consortium partners will develop modeling capabilities that cut across general threats and targets, represented by application areas such as electrical power, transportation and telecommunications. Additionally, the Homeland Security Center will develop tools for planning responses to emergencies to minimize the threat to human lives and reduce the economic impact in the event of an attack.

The HS Center will work closely with the Department of Homeland Security to prioritize key research areas, and is also expected to provide educational programs related to their grant. The grant allows the HS Center to pursue research and development and educational programs in accordance with DHS priorities. This will provide the Department with peer-reviewed, scientifically-validated assessments and models and independent technical expert advice.

Q3b. How does the S&T Directorate anticipate that these products will ultimately be employed to support the Department's mission or to assist State and local governments and emergency responders?

A3b. The Department of Homeland Security envisions using the assessment products to improve estimates of the risks of various attacks. These improved risk estimates will aid decision-makers in prioritizing terrorist threats and identifying optimal risk management measures, and to develop guidelines for risk management. Models may also have the potential to be used in conjunction with global information system (GIS) software to evaluate security improvements of critical infrastructure and surrounding environments.

As proposed by the University of Southern California (USC), a GIS emergency model would be developed to evaluate a set of plans, for example, estimating the delays in receiving medical care, applying disaster relief, and speeding response and recovery. Also, USC has proposed emergency response modeling that incorporates personnel and equipment resource allocations during the response to a catastrophic terrorist attack. In addition to homeland security applications related to terrorist threats, the assessment products will aid the Department's operational end-users in preparedness and response to natural and man-made accidental disasters.

Q3c. How will the Center's research program address the priorities governing the Department's research and development strategy?

A3c. The priorities governing the Department's research and development strategy, with particular emphasis on critical infrastructure protection, were set forth in the Broad Agency Announcement (BAA) for the Center award. DHS focused the first HS Center on Risk-Based and Economic Analysis of Terrorist Events in order to validate models that may provide direct input on the risk and economic impacts of terrorism. This input will assist the Science and Technology Directorate prioritize its research agenda. This topic was also included in the National Academies of Sciences report, *Making the Nation Safer.*

Q3d. The announcement indicates the Department anticipates a three-year grant of $12 million for the Center. At the end of that period, will the grant be re-competed?

A3d. DHS S&T will determine to re-compete or extend a specific grant based on several factors, including but not necessarily limited to: review and evaluation of the Center's objectives and outcomes; the Department's understanding of current and emerging threats; defined and anticipated requirements of operational end-users; interagency priorities for workforce development in the sciences and engineering fields; achievement of regional diversity necessary to strengthen and sustain the homeland security complex and Departmental ties to state and local end-users; and priorities and resources within University Programs.

Q4. **Role of the DOE Labs—***On December 17, 2003, Dr. Maureen McCarthy, the Director of the DHS Office of Research and Development, sent a memorandum to the DOE National Laboratories of the Department of Energy. This memorandum described the anticipated relationship between the Department and the various Laboratories.*

Q4a. Please submit a copy of Dr. McCarthy's memorandum for the record.

A4a. The Memorandum for the Record identified in this question is attached here. In addition, a second memo on "Additional Guidance to the DOE National Laboratories to Assist their Decision-Making on Participation in Department of Homeland Security Science & Technology (DHS/S&T) Programs" follows the Memorandum for the Record.

U.S. Department of Homeland Security
Washington, DC 20528

Homeland Security

December 17, 2003

Memorandum

TO: Hermann Grunder, Director, Argonne National Laboratory
Allan Will, Acting Operations Manager, Bechtel Nevada, Remote Sensing Laboratory
Praveen Chaudhari, Director, Brookhaven National Laboratory
Paul Kearns, Acting Director, Idaho National Engineering and Environmental Laboratory
Michael Anastasio, Director, Lawrence Livermore National Laboratory
George P. Nanos, Director, Los Alamos National Laboratory
Jeffrey Wadsworth, Director, Oak Ridge National Laboratory
Leonard K. Peters, Director, Pacific Northwest National Laboratory
C. Paul Robinson, Director, Sandia National Laboratory

FROM: Maureen McCarthy
Director, Office of Research and Development

SUBJECT: Utilization of DOE National Laboratories to Support Homeland Security S&T

Summary

The purpose of this memo is to explain the policy and procedures of the Department's Science & Technology Directorate (DHS/S&T) for utilizing the capability base of the Department of Energy (DOE). The DOE DOE National Laboratories, sites, and technology centers have a tremendous breadth of technical expertise and capability in areas related to homeland security. The nation has invested in building this capability base for over sixty years. The DHS/S&T is committed to maximizing the opportunities for all of the DOE assets to play a role in supporting the missions of the Department.

In accordance with the Homeland Security Act of 2002, the S&T Directorate may utilize the broad base of capabilities at the Department of Energy's DOE National Laboratories and sites to meet homeland security mission requirements. The Homeland Security Act of 2002 requires that DHS/S&T manage both intramural and extramural programs to satisfy homeland security mission requirements.

In carrying out its mission requirements, it has become necessary for DHS/S&T to establish a division between intramural and extramural programs. This division will guard against organizational conflicts of interest and inappropriate use of inside government information in responding to competitive solicitations open to the private sector.

DHS/S&T is therefore implementing separate mechanisms to access the capability base at the DOE DOE National Laboratories for extramural and intramural programs. Designation of "intramural" and "extramural" laboratories is a practical consequence.

Based on an assessment of the intramural and extramural mission requirements, laboratory self-assessments, institutional core competencies, and external technical and user reviews of proposed projects, the *DOE National Laboratories that are designated to lead the intramural programs* are Lawrence Livermore, Los Alamos, Oak Ridge, Pacific Northwest, and Sandia DOE National Laboratories.

The *laboratories designated to participate in the extramural programs* are Argonne, Brookhaven, Idaho Environmental and Engineering, and the Bechtel-Nevada laboratories. The DOE National Laboratories that participate in the extramural programs may also be involved in projects and tasks through the intramural programs under appropriate conflict of interest safeguards.

All other DOE DOE National Laboratories, sites, and technology centers are also eligible to participate in DHS/S&T extramural programs. All DOE DOE National Laboratories are invited to continue participation in the University Programs' DHS Scholars/Fellows Program, and to contribute content and utilize information-sharing benefits of the Office of Research and Development's (ORD) Intranet web site.

The Office of DOE National Laboratories is responsible for ensuring that processes are in place to maximize opportunities for the DOE DOE National Laboratories to participate in both intramural and extramural programs while avoiding organizational conflicts of interest.

Extramural Programs

The extramural programs are aligned with the mission requirements that are best suited for execution by entities in the private sector. The majority of this work will be procured through open competitive solicitations managed by the Homeland Security Advanced Research Projects Agency (HSARPA) and Systems Engineering & Development (SED). The HSARPA conducts extramural programs for DHS/S&T that engage the private sector through research, development, test, and evaluation (RDT&E) programs to satisfy homeland security mission requirements. The SED manages extramural homeland security project offices for operational and pilot deployments, technology test beds, and limited-scale systems acquisition.

HSARPA and SED are structuring these programs to engage the broadest base possible from the private sector to provide the Nation with efficient, effective, and innovative solutions to challenging homeland security problems now and in the future. They are engaging industry, the academic community, and private research institutes through contracts, cooperative agreements and grants.

At present, the nine DOE DOE National Laboratories receiving this memo are not eligible to participate in extramural programs that involve open, competitive solicitations to the private sector through HSARPA and SED, because they have received internal government planning information that could provide an unfair competitive advantage. Effective January 1st, the DOE National Laboratories with capabilities aligned with the mission responsibilities of HSARPA and SED will be eligible to participate in the openly competed extramural programs, with expected adherence to federal regulations governing such competitions.

Intramural Programs

The intramural programs draw upon the expertise of federal laboratories (whether government or contractor operated); these programs are managed by ORD. The ORD's intramural RDT&E programs, designed to provide the Nation with an enduring homeland security capability, are executed at the DOE DOE National Laboratories, DHS laboratories, the National Biodefense Analysis and Countermeasures Center, and through partnerships with other federal agencies.

The intramural programs will be focused on mission requirements involving:

- specialized/unique federally-owned facilities, assets or materials;
- classified research;
- analytic and technical support to other DHS directorates and federal agencies for threat characterization and vulnerability assessments on new and emerging threats;
- coordination with national security programs by other government agencies;
- a cadre of dedicated scientists and engineers that can provide independent technical assessments and advice to the Federal Government;
- unique or specialized capabilities and technologies that the private sector does not have business incentives to pursue; and/or
- technical support to develop federal regulations, standards, and certifications.

In addition, the ORD will establish an Office to provide Operational Test & Evaluation (OT&E) support to DHS/S&T. The selection of laboratories/sites to lead the ORD/OT&E activities is still under review, pending further development of plans and requirements.

Because staff at the intramural laboratories may have access to internal government information as part of the nature of the intramural programs, the laboratories that play a significant role in the intramural programs will be ineligible to participate in DHS/S&T extramural programs that involve competitive solicitations open to the private sector.

FY04 Funding for Extramural and Intramural Programs

ORD, HSARPA and SED execute RDT&E programs in accordance with the mission requirements defined by the DHS/S&T Office of Programs, Plans and Budgets

(S&T/PPB). An illustration of DHS/S&T's functional organization is attached. In accordance with annual DHS/S&T program guidance, while some portfolios will be managed entirely by HSARPA or SED, the major portfolios will have both intramural and extramural programs that will execute specific missions requirements within an agreed upon scope and budget. DHS/S&T portfolio descriptions are also attached. The division of intramural and extramural mission requirements for ORD, HSARPA and SED is determined by DHS/S&T senior leadership.

In FY04, the majority of the ORD intramural programs are in Biological Countermeasures, Radiological/Nuclear Countermeasures, Threat & Vulnerability Testing & Assessment, and Standards. The ORD will have limited (less than $10M) or no program management responsibility for the remaining portfolios.

The majority of the DHS/S&T programs will be extramural and will be executed through open, competitive solicitations to the private sector. The most significant HSARPA programs are in Rapid Prototyping, Radiological and Nuclear Countermeasures, Chemical Countermeasures, Biological Countermeasures, Threat & Vulnerability Testing & Assessment, and Cyber Security.

In addition, HSARPA will have primary responsibility in DHS/S&T for executing RDT&E programs for the conventional mission portfolios (BTS, USCG, and USSS) and for enhancing the engagement of the private sector across all portfolios.

The SED will have the responsibility for systems integration, demonstration test & development, and acquisition for all programs within DHS/S&T including, Counter MANPADs, BioWatch, NYNJ Port Authority Test Bed, and SAFECOM.

Special provisions will be made to ensure that ongoing activities in the Critical Infrastructure Protection program can continue under the existing management structure.

Conclusion

In closing, I offer my sincere gratitude to you and your staff for all your efforts in identifying capabilities, developing technical proposals, and defining roles and responsibilities of the DOE National Laboratories to support homeland security programs in the Department's Science DHS/S&T. The homeland security capabilities at all the Department of Energy DOE National Laboratories, technology centers, and sites are important and vital resources to the S&T Directorate. It is essential that the Nation's best and brightest scientific and technological expertise be engaged in the homeland security mission. The S&T Directorate is committed to utilizing the extensive capabilities of the all of the DOE DOE National Laboratories to protect the homeland.

Dr. Caroline Purdy, Deputy Director, Office of DOE National Laboratories, will be contacting the Homeland Security Directors at your laboratories to arrange a meeting or conference call within the next weeks to discuss issues pertaining to this memo. Dr. Purdy may be reached (202) 772–9979 or by e-mail at caroline.purdy@dhs.gov.

Attachments:

DHS S&T Organization by Function
Abstract Descriptions of DHS S&T Portfolios

cc: Donald Joyce, Argonne National Laboratory
Richard Tighe, Bechtel Nevada Remote Sensing Laboratory
Paul Moskowitz, Brookhaven National Laboratory
John Noon, Idaho National Engineering and Environmental Laboratory
Don Prosnitz, Lawrence Livermore National Laboratory
Wiley Davidson, Los Alamos National Laboratory
Gordon Michaels, Oak Ridge National Laboratory
Ned Wogman, Pacific Northwest National Laboratory
Richard Stullen, Sandia National Laboratory

MEMO: (Date of transmittal: 3/26/04)

To: Laboratory Directors and Homeland Security Coordinators

From: Maureen McCarthy

Subject: Additional Guidance to the DOE National Laboratories to Assist their Decision-Making on Participation in Department of Homeland Security Science & Technology (DHS/S&T) Programs

The Department of Homeland Security, through Section 309 of the Homeland Security Act of 2002, is provided access to the DOE National Laboratories and sites managed by the Department of Energy to carry out the missions of DHS. The DHS Science and Technology Directorate (S&T) wishes to make the best use of each of these laboratories and sites in consonance with statute, regulation, and policy, and thus it is asking laboratories and sites to make a decision regarding their desired mode of interaction with the Directorate. That decision carries with it several implications, which this memorandum should clarify. S&T is requesting that you respond by *COB 31 March* in writing to U/S McQueary with your decision on how you wish to participate in S&T programs. U/S McQueary will be scheduling a meeting with you in early April to discuss S&T plans and programs involving the DOE National Laboratories. Please contact me directly if you need more information or have any requests.

Clarification of the Issue for Decision:

- A national laboratory may choose to participate in S&T's internal strategic planning and program development processes *or,* if otherwise permissible under applicable law, regulation, contract, and DOE policy, to respond to certain types of S&T solicitations open to the private sector.
- The general prohibition against Federal Funded Research & Development Centers (FFRDCs) competing with the private sector contained in the Federal Acquisition Regulation (FAR) 35.017(a)(2) continues to apply. Accordingly, DOE National Laboratories are not permitted to directly respond or participate as a team member in a response to a Request for Proposals (RFP).
- However, the FAR allows FFRDCs to respond to certain kinds of research and development solicitations such as Broad Agency Announcements (BAA) available to the private sector. Accordingly, DOE National Laboratories that are FFRDCs may respond to BAAs and other similar research and development solicitations in accordance with the FAR and Section 4(a and b) of Department of Energy Order 481.1B of September 28, 2001. S&T utilizes such solicitations to execute its programs through the Homeland Security Advanced Research Projects Agency (HSARPA), the Office of Systems Engineering & Development (SED), and the Office of Research & Development's University Programs (ORD/University Programs).
- Additionally, consistent with current DOE policy, DOE National Laboratories are not precluded from providing potential RFP respondents with lab capability statements in order to make available, post award, laboratory capabilities and expertise. If it is determined that a critical expertise or capability exists at a laboratory, the S&T may, prior to issuance of a RFP, enter into a directly funded agreement with DOE to make those services available to all respondents as government furnished services. DHS/S&T-procured laboratory expertise or capability will be made available on an equal and non-discriminatory basis to all respondents to the RFP.
- Notwithstanding the above, a national laboratory will be barred from participating in BAAs if it opts to participate in support of S&T's strategic planning and program development processes. This is because as a result of such participation, S&T will give it access to internal DHS strategic planning information. DHS policy is that if any non-DHS entity, including a national laboratory, receives that kind of information, DHS considers that entity to have an "organizational conflict of interest" that makes the entity ineligible to participate in any solicitations open to the private sector issued by S&T. This level of exposure to sensitive information would give such an entity a competitive advantage that would make it inappropriate for the entity to participate in any future solicitation open to the private sector for a prescribed period of time.
- A laboratory will remain ineligible to participate in such S&T solicitations for three years after it ceases engagement in the S&T strategic planning and program development process.

Opportunities Open to All Laboratories

- *All* laboratories are eligible to execute DHS mission-directed projects through ORD in accordance with S&T mission requirements and program execution plans. A laboratory's ability to receive direct DHS funding for mission-directed projects is independent of whether or not it participates in S&T strategic planning.
- *All* laboratories are eligible to execute DHS mission-directed projects through SED in accordance with S&T mission requirements and program execution plans. A laboratory's ability to receive DHS direct funding for mission-directed project is independent of whether or not it participates in S&T strategic planning.
- *All* laboratories are eligible to serve as a technical resource to S&T to provide Government Furnished Information (GFI) and Government Furnished Equipment (GFE) through HSARPA and SED.
- Technical experts from any laboratory may serve as Subject Matter Experts (SMEs) and provide scientific reach-back for DHS for emergency and incident operations, and regional support.

Execution of Work at the DOE National Laboratories:

- Execution of all S&T programs at the DOE National Laboratories will be conducted in accordance with the Memorandum of Agreement Between Department of Energy and Department of Homeland Security (dated 28 Feb 2003) and DOE Notice 481.1A, Reimbursable Work for the Department of Homeland Security (dated 21 April 2003).

Issues to Consider:

1. S&T must maintain a homeland security complex that will provide the Nation with an enduring capability to meet homeland security mission requirements now and in the future. The homeland security complex consists of:
   - An interdisciplinary cadre of dedicated experts working on homeland security missions, with appropriate supporting infrastructure
   - Programs scoped and resourced to ensure the Federal Government has the core competencies to counter new and emerging threats
2. S&T may make strategic and focused investments at certain government laboratories and sites in order to establish and maintain mission-critical core competencies. Limited resources are currently available to support these efforts. A laboratory's decision to participate in the S&T strategic planning process is independent of S&T's decision to make future strategic investments in that institution.
3. The majority of S&T programs that are targeted at developing, testing and transitioning homeland security technologies and capabilities to operational end-users are managed by HSARPA and SED. These include, e.g., the development of technologies for prevention & detection and response & recovery.
4. The programs that are potentially the subject of direct funding to the DOE National Laboratories will be primarily focused on: 1) scientific-based threat and vulnerability assessments, and 2) systems architecture design & analysis. At present, S&T is committed to making strategic investments to establish and maintain core competencies in the following program areas: Biological Countermeausures, Radiological/Nuclear Countermeasures, Threat & Vulnerability Testing & Assessment, Chemical and High-Explosive Countermeasures. S&T will also support direct funding of projects in these and other portfolio areas.
5. S&T will primarily conduct mission-directed applied research. S&T will leverage the basic research investments made by other government agencies. In order to strengthen this link, S&T and DOE Office of Science (DOE/SC) have recently formed a working group to coordinate program activities and to advise DOE/SC on how it can support homeland security by enhancing long-term fundamental science efforts in mission-critical areas.

Q4b. Would you please describe the types of intramural research programs Dr. McCarthy intends to establish at the Department?

A4b. The DHS Science and Technology intramural programs are research, development, test & evaluation programs that are managed by the Office of Research and Development (ORD) and executed at government laboratories (either government or contractor operated) in accordance with S&T mission requirements.

There are five major program areas for intramural programs that are expected to be executed through the ORD through FY 2004–2009.

- Biological Countermeasures: provides the science and technology needed to reduce the probability and potential consequences of a biological attack on this nation's civilian population, its infrastructure, or its agricultural system. The DOE National Laboratories will assist in developing and implementing an integrated systems approach with a wide range of activities, including vulnerability and risk analyses to identify the need for vaccines, therapeutics, and diagnostics; development and implementation of early detection and warning systems to characterize an attack and permit early prophylaxis and decontamination activities; and development of a national bioforensics analysis capability.
- Radiological/Nuclear Countermeasures: provides the science and technology needed to reduce both the probability and the potential consequences of a radiological or nuclear attack on the Nation's civilian population or nuclear power facilities. The DOE National Laboratories assist in providing the end-user community with the most appropriate and effective detection and interdiction technologies available to prohibit the importation or transportation and subsequent detonation of a radiological or nuclear device within U.S. borders.
- Threat and Vulnerability, Testing & Assessment: provides the science and technology needed to develop methods and tools to test and assess threats and vulnerabilities to protect critical infrastructure and enhance information exchange.

  Activities are designed to help evaluate extensive amounts of diverse threat information; detect and document terrorist intent; couple threat information with knowledge of complex, interdependent critical infrastructure vulnerabilities; and enable analysts to draw timely insights and distribute warnings from the information.

  The DOE National Laboratories will contribute to the development and operation of a large Threat and Vulnerability Information System (TVIS) that will draw on advances in the information and computer sciences as well as innovative analytic techniques, help produce high-quality net assessments and assessments of weapons of mass destruction, development of advanced computing algorithms in support of improved aerosol dispersion models, blast effects calculations, neutron interrogation models, bioinformatics, and scalable information extraction; and the development of biometrics for precise identification of individuals and instrumentation to aid authorized officials in detecting individuals with potentially hostile intent.
- Chemical and High-Explosive Countermeasures: provides the science and technology needed for reducing the Nation's vulnerability to chemical attacks on its civilian population and infrastructure, and addresses the threat that terrorists will use explosives in attacks on buildings, critical infrastructure, and the civilian population in the United States. The DOE National Laboratories will contribute to efforts to protect facilities from chemical attacks and to control the industrial chemicals that may be used for such attacks; will assist in development and fielding of equipment, technologies and procedures to interdict suicide bombers and car and truck bombs before they can reach their intended targets.
- Standards: as envisioned in the Homeland Security Act, the Standards portfolio seeks to improve the effectiveness, efficiency and inter-operability of the systems and technologies developed by the S&T Directorate. The DOE National Laboratories will contribute to development of technical standards and test and evaluation protocols for decontamination technologies and analysis across the range of weapons of mass destruction.

Q4c. For FY 2004, the intramural programs receive $120 million and the extramural programs are allocated $213 million. Which programs in the directorate are contributing funds to these programs?

A4c. The funding division indicated in the question has since been refined, based on execution plans recently approved for research, development, testing and evaluation programs and their implementation through the Homeland Security Advanced Research Projects Agency (HSARPA), Office of Research and Development (ORD), and Office of Systems Engineering and Development (SED).

The table presented on the next page provides the funding division currently expected for intramural and extramural performance of research, development, testing and evaluation. These values may change based on execution year program adjustments to optimize meeting S&T requirements. The intramural allocation reflects participation of DHS and other federal agency laboratory participation in program execution, in addition to Department of Energy DOE National Laboratories and sites.

Intramural and Extramural Allocations for FY 2004, by DHS S&T Portfolio

Portfolio	FY 2004 Intramural Allocation (millions of dollars)	FY 2004 Extramural Allocation (millions of dollars)
Bio Countermeasures, including the National Biosecurity Analysis and Countermeasures Center	133.9	123.9
Chemical and High-Explosives Countermeasures	13.6	39.2
Radiological and Nuclear Countermeasures	52.9	57.9
Threat and Vulnerability Testing and Assessment, including Critical Infrastructure Protection and Cyber Security	41.2	34.8
Standards	32.1	2.0
Components (Border and Transportation Security, Emergency Preparedness and Response, U.S. Coast Guard and U.S. Secret Service)	19.2	12.6
University Programs	0.0	61.2
Emerging Threats	5.0	13.4
Rapid Prototyping	0.0	65.6
Counter MANPADS	0.0	60.0
TOTAL	297.9	470.6

Q4d. What are the requested funds for each program in the FY 2005 budget?

A4d. The President's budget request for FY 2005 for the DHS Science and Technology Directorate's portfolios is given below; numbers are in millions of dollars:

Biological Countermeasures	407.0
Chemical and High Explosives Countermeasures	62.7
Radiological and Nuclear Countermeasures	129.3
Threat and Vulnerability Testing and Assessment	101.9
Standards	39.7
Components	34.0
University Programs	30.0
Emerging Threats	21.0
Rapid Prototyping	76.0
Counter-MANPADS	61.0

The Science and Technology Directorate has initiated a threat-based strategic planning process which will inform allocations of the Directorate's FY 2005 funding,

taking into account a range of budget scenarios in response to passage of the Department's annual appropriation.

Q4e. How will the competition for extramural research programs be managed by the Directorate?

A4e. In accordance with the Homeland Security Act, the Homeland Security Advanced Research Projects Agency (HSARPA) is responsible for administering competitive, merit-reviewed grants, cooperative agreements, contracts or other transactions for research or prototypes to public or private entities, including businesses, federally funded research and development centers (FFRDCs), and universities. HSARPA structures and manages its competitions to ensure that DHS requirements are met through the active engagement of the private sector, and awards contracts for extramural programs and projects based on technical merit and feasibility reviews.

The solicitations released through HSARPA (as well as S&T's Office of Systems Engineering and Development) seek to the maximum extent possible to capture the best ideas and solutions. To achieve this end, Broad Agency Announcements (BAAs) or Research Announcements (RAs) are the preferred mechanisms. Under a BAA or RA, teams are not in direct competition; each team is judged on the basis of the unique ideas proposed to solve the broadly defined technology challenge evaluated against the published criteria.

HSARPA has also instituted a competitive process to award Small Business Innovation Research (SBIR) grants.

Q4f. What is the relationship between these research programs and the University Centers of Excellence being established by the Department?

A4f. The Science and Technology Directorate has a coordinated approach to generating requirements, which are met through extramural and intramural execution of research, development, testing and evaluation programs, and also through grants awarded to the university-based Homeland Security Centers of Excellence (HS Centers).

The Centers of Excellence complement other programs within the Department and Federal Government that fund project-focused research to develop and deploy specific homeland security technologies and capabilities. The S&T Directorate strongly encourages HS Centers to partner with other colleges and universities, National and DHS laboratories, industry, and/or State and local governments. The HS Centers will be expected to coordinate efforts with relevant federal, State and local agencies and private institutions, to minimize duplication in R&D, enhance communications among programs, and leverage financial support.

Moreover, the Centers of Excellence, DHS laboratories, DOE National Laboratories, and other federally funded research and development centers (FFRDCs) together comprise the homeland security complex. Through information-sharing, infrastructure support, and exchange of personnel across these institutions, we can achieve and effectively steward an integrated network of people, places and programs dedicated to homeland security, to build an enduring capability for the Nation.

Q5. **Data vs. Knowledge—***Significant efforts are being made to apply information technologies to the detection and identification of terrorists. There are, however, many examples where the ability to* collect *data overwhelms the ability to extract* useful knowledge *from that data.*

Q5a. What guidelines do we use to determine when technology is an aid, and not a hindrance, to security?

A5a. The Science and Technology Directorate believes strongly that our research, development, testing and evaluation program must be sensibly prioritized. The S&T Directorate uses Integrated Product Teams (IPTs) to prioritize its programs. These IPTs, made up of membership from each of the four Offices in the Directorate, are integral to the S&T planning process. Each IPT covers a focused portfolio or program area and works as a team to determine mission space, strategic goals for the next five years, and a list of prioritized deliverables. In this process, each IPT considers the directives, recommendations and suggestions from many sources, including legislation, National priorities and operational end-user needs and requirements as well as considering the costs of operation and maintenance of a given technology.

In all our technology development areas, including information technologies, the S&T Directorate engages operational end-users both in the identification of needed capabilities and as a critical source for feedback on developed and field tested applications. This input is essential to ensure we are developing capabilities and tech-

nologies that have a positive impact on protecting the Nation's citizens, emergency responders and critical infrastructure.

Q5b. To what extent is the Directorate evaluating proposals for technical systems to determine whether they offer real reductions in cost and/or risk?

A5b. The Science and Technology Directorate does evaluate proposals for technical systems to determine if they offer real reductions in cost and/or risk.

A specific example of this is our work in Critical Infrastructure Protection. Decisions affecting our Nation's critical infrastructures are too important to be made without performing analyses beforehand that carefully weigh the benefits of reducing risks with the cost of protective actions. The most effective way to examine these tradeoffs is to utilize a decision support system that incorporates the results of threat assessments, vulnerability assessments, and analyses that are based on comprehensive, advanced modeling and simulation. Such a decision support system could be used by government (Federal, State, local) and industry decision makers to prioritize protection, mitigation, response, and recovery strategies as well as to support red-team exercises and provide real-time support during crises and emergencies.

The Critical Infrastructure Protection Decision Support System (CIP/DSS) project aims to develop such a decision support system. The value of the CIP/DSS is that it will incorporate a wide variety of disparate information into a well conceived modeling framework supporting decision-making related to critical infrastructure protection. Los Alamos, Sandia and Argonne DOE National Laboratories are teaming to provide an "iterative development" approach where the focus in the first year has been on a set of analytical tools that provide decision-makers with an initial capability to set priorities for reducing infrastructure vulnerabilities. It includes all major critical infrastructures (and key assets) and their primary interdependencies. The initial proof-of-concept work began in August 2003 and delivered a prototype model and case studies in February 2004. This prototype model included representation of all fourteen critical infrastructures and their primary interdependencies.

Activities in this and subsequent fiscal years will improve the integration, resolution, and fidelity of the individual infrastructure models, and will greatly improve the interdependencies models. It will also incorporate vulnerability and threat data in order to ultimately provide a "risk-based" prioritization decision support system.

Q5c. To what extent did the Directorate contribute to the design, development and implementation of the "Total Information Awareness"—or "Terrorism Information Awareness"—proposal by the Department of Defense, and the second-generation "Computer Assisted Passenger Prescreening System" by the Transportation Security Administration?

A5c. The Science and Technology Directorate did not contribute to either the Total Information Awareness or Computer Assisted Passenger Prescreening System program.

Q5d. The budget briefing for "Threat and Vulnerability Testing and Assessment" indicates that the Directorate is working to "develop instrumentation to aid in detecting individuals with particularly hostile intent." Would you explain the type of instrumentation being considered and how you anticipate it will be used?

A5d. Efforts in the Determination of Intent program have so far been limited to proof-of-concept demonstrations by university research groups. Three types of system are being considered or evaluated, namely, human kinetics (body movements) or speech characteristics suggestive of stress or deception and remote, covert sensing (using near-infrared imaging) of brain activity associated with deception. The Threat and Vulnerability, Testing and Assessment Portfolio (TVTA) portfolio is also intending to fund a series of National Academies of Sciences studies on social and behavioral indicators of terrorist intent. Finally, funds have been allocated in FY 2004 to the Homeland Security Advanced Research Projects Agency (HSARPA) for a comprehensive Broad Agency Announcement (BAA) on Scene Understanding, which will enable a broad range of research to be funded on human kinetics.

Q6. **HSARPA—***The Department was given an entity—HSARPA—that was to do for Homeland Security research what DARPA has done for Defense research. DARPA is widely seen to be a model of applied research innovation—they rotate in top people from industry and academe, they pick the most promising approaches to solving a problem and nurture them until a wise choice can be made, and they accelerate the movement from development to deployment through their funding efforts.*

What progress have you made in setting up HSARPA, and in what ways will it conduct business as DARPA does and in what ways do you believe it will (should) differ?

A6. The Homeland Security Advanced Research Projects Agency (HSARPA) came into existence on March 1, 2003, with other parts of the Department of Homeland Security (DHS). Its first employee, the Deputy Director, was detailed to HSARPA from the Office of Naval Research on May 5, 2003. HSARPA is active and growing.

Like DARPA, HSARPA has a philosophy of bringing in senior technical managers and, after their project's lifespan, rotating them back out to the broader technical community. To date, HSARPA has recruited twelve technical experts in their respective disciplines, most with extensive government program management experience. HSARPA has made good use of the tools given by the Congress to hire and retain just such people. It has used all five methods of hiring available to it under the law, i.e., DHS employee, Inter-governmental Personnel Act, Section 1101 Experimental Personnel Hiring Authority, other government detailees, and contractor. The Intergovernmental Personnel Act authority and the Experimental Personnel Management Program (EPMP) in particular are excellent recruitment tools.

Aside from an emphasis on hiring practices, however, the analogy between DARPA and HSARPA is at best a weak one. DARPA exists within the Department of Defense as a means for performing undirected research and development—that is, research and development that is not initiated and directed in pursuit of an explicit customer need. Most of the research and development activities within the Department of Defense but outside of DARPA are in fact directed, and are performed within the acquisition chains of the respective military Service, or at places like the Missile Defense Agency or the Defense Threat Reduction Agency, in pursuit of specific needs.

In contrast, within the Department of Homeland Security there are no "Service" research and development entities that span the space of activities required by the President's National Strategy for Homeland Security or the responsibilities associated with the Homeland Security Act. Thus, HSARPA is the primary means for procuring research and development from the private sector, including activities that are driven by customer requirements. Those needs and requirements are generated within portfolios in the Plans, Programs, and Budget (PPB) Office of the Directorate, which reports to the Under Secretary.

The PPB Office manages and executes the Planning, Programming, and Budgeting System (PPBS) cycle for the Directorate, and hence represents the primary management tool utilized by the Under Secretary in developing a strategic plan, establishing priorities, budgeting, and monitoring execution as required by Section 302 of the Homeland Security Act. The Under Secretary, through the Office of PPB, sets short-, mid-, and long-range goals aimed at achieving the needs set out by the Administration. These goals include, for example, countering the threat of weapons of mass destruction and addressing the needs of customers in the operational Directorates in the Department and of state and local entities.

Membership from all of our executing Offices—Office of Research and Development (ORD), Homeland Security Advanced Research Projects Agency (HSARPA) and the Office of Systems Engineering and Development (SED)—participates actively in the PPB process through integrated product teams (IPTs). These IPTs are integral to the planning process. The IPTs for each portfolio work as a team to determine their mission space, their strategic goals for the next five years, and a list of prioritized deliverables. The executing Offices then respond to the prioritization process with programs that are subsequently executed. HSARPA is responsible for the execution of its programs and determines, within the overall funding constraints dictated by the Under Secretary, the Department, and the Congress, the resources needed to meet the milestones and objectives of a particular program as laid out by the PPBS.

HSARPA performs its execution functions by awarding research contracts, grants, cooperative agreements, or Other Transactions for Research or Prototypes to private entities, businesses, federally funded research and development centers, and universities. All solicitations to date have been open competitions with winners selected on technical merit, contribution to the Department's missions, and best value to the government.

Additionally, unlike DARPA, we have a mixed set of needs that vary by region. The military services have a strong understanding of equipment inter-operability and its configuration control. In contrast, DHS must cope with large differences in scale (from large metropolitan cities to rural areas) and a broad variety of communications, firefighting, law enforcement, and protective equipment. Our research, development, and systems must account for—and match—regional needs. Our tech-

nology developments must be tailored to existing vulnerabilities, local government requirements, methods of operations and especially to existing legacy systems.

It was recognized early that, despite the need for HSARPA to execute requirements-driven programs, a true "DARPA-like" function also needed to be performed. Thus, there is an Emerging Threats budget line that is primarily for the use of the Director of HSARPA to develop and execute programs that are explicitly not requirements-driven. The role of PPB in that area is simply to set overarching policy, to review the efforts for technical soundness and relevance to the needs of homeland security periodically, and to oversee budget execution. If HSARPA were to become truly "DARPA-like" in character, then another organization would need to be created to execute within the private sector the needs-driven R&D of the Department. This function is where the large majority of private sector funding would reside (as with DoD), and the remaining (non-requirements driven) HSARPA would be quite small. The economies of scale associated with combining both directed and undirected research and development procurements with the private sector are obvious.

Not all private sector R&D is, however, procured through HSARPA. For example, there are programs where the key issue is not technical-the need to invent some new capability-but rather the need to impose a disciplined systems engineering process in order to deliver the capability in a timely and efficient manner. Those efforts (e.g., counter-MANPADS) reside within the Systems Engineering and Development office. In addition, capital investments, such as the planned National Biodefense Analysis and Countermeasures Center (NBACC) facility, are not executed through HSARPA. Finally, private sector investments made through another government agency (e.g. standards work through the National Institute of Standards and Technology) may be, but are not always, executed most efficiently through HSARPA.

Q7. **Building Decontamination—***Please respond to Mr. Lampson's question during the hearing concerning EPA's $8.2 million reduction in homeland security building decontamination research.*

The following is an excerpt from the hearing transcript [Added by DHS Office of Legislative Affairs]:

> *"Dr. McQueary, in the Environmental Protection Agency budget documents, we find an $8.2 million reduction that represents complete elimination of homeland security building decontamination research. We have a little bit of an interest in that around here because of the anthrax and the ricin that caused building shutdowns recently.*
>
> *Would you explain the logic behind the decision to eliminate this research? And would you agree that the value of a network to detect the presence of hazardous agents is diminished if we haven't determined the most effective ways to recover from the attacks detected by that network?"*

A7. There has been much concern in Congress about the Administration's proposed complete elimination of homeland security building decontamination research at the U.S. Environmental Protection Agency (EPA). I want to state very clearly that the Department of Homeland Security believes that decontamination research is critically important. Without full recovery from any potential terrorist attacks, we have not met our full mission, which ranges from Awareness to Recovery. We must have active research and development (R&D) to ensure full decontamination and full recovery. With respect to the particular question of EPA's decontamination R&D budget, I understand that the FY 2005 budget does not include a request in the area of building contamination research because unexpended existing funds from previous years will carry over and ensure that this important research is fully funded. In fact, the Budget continues to fund decontamination research, the program's technical staff will remain intact, and the EPA will still be able to achieve its core homeland security responsibilities.

However, specific requests regarding the EPA's FY 2005 budget request and their R&D programs should be referred to EPA. I assure you we will work with the EPA to address the critical research needed for decontamination.

Questions submitted by Representative Judy Biggert

Q1. In your letter of March 4, 2004, you stated that the DHS would convene an external panel to "review and offer suggestions" on the policy of dividing the DOE laboratories into intramural and extramural groups.

Q1a. Will the external panel be charged with developing an alternative to the previous intramural/extramural designations, or might the panel endorse the previous designations made by the DHS?

A1a. The Department of Homeland Security, through Section 309 of the *Homeland Security Act of 2002,* is provided access to the DOE National Laboratories and sites managed by the Department of Energy (DOE) to carry out the missions of DHS.

The DHS Science and Technology Directorate, wishing to make the best use of each of these laboratories and sites in consonance with statute, regulation, and policy, asked laboratories and sites to make a decision regarding their desired mode of interaction with the Directorate—to participate in S&T's internal strategic planning and program development processes or, if otherwise permissible under applicable law, regulation, contract, and DOE policy, to respond to certain types of S&T solicitations open to the private sector.

On March 31, 2004, the following DOE National Laboratories and sites communicated their decision to Under Secretary McQueary to participate in S&T's internal strategic planning and program development processes: Argonne National Laboratory, Bechtel Nevada, Brookhaven National Laboratory, Idaho National Engineering and Environmental Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, and the Sandia DOE National Laboratories.

An external review will be conducted to assess the baseline capabilities of the DOE National Laboratories and sites to provide the Department with an enduring capability to meet long-term mission requirements. The results of this review will be utilized by the Homeland Security Science and Technology Advisory Committee (HSSTAC) to advise the Department on options for establishing a long-term strategic relationship with the DOE National Laboratories and sites.

Q1b. If the external panel recommends an alternative to the intramural/extramural designations previously made by the DHS, will the DHS adopt the panel's recommendations?

A1b. As previously discussed, the following DOE National Laboratories and sites communicated their decision to Under Secretary McQueary to participate in S&T's internal strategic planning and program development processes: Argonne National Laboratory, Bechtel Nevada, Brookhaven National Laboratory, Idaho National Engineering and Environmental Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, and the Sandia National Laboratories. The designation of intramural/extramural is therefore no longer necessary for the nine laboratories and sites under consideration.

DHS will consider all recommendations and advice provided by external reviews. The results of the review will also be utilized by the Homeland Security Science and Technology Advisory Committee to advise the Department on options for establishing a long-term strategic relationship with the DOE National Laboratories.

Q1c. If the external panel is not charged with developing an alternative to the previous intramural/extramural designations, and/or its recommendations are not binding on DHS, please explain the value in convening an external review panel.

A1c. As mentioned above, the designation of intramural/extramural is therefore no longer necessary for the nine laboratories and sites under consideration. The Department of Homeland Security will consider all recommendations and advice provided by external reviews. The results of the review will also be utilized by the Homeland Security Science and Technology Advisory Committee to advise the Department on options for establishing a long-term strategic relationship with the DOE National Laboratories.

Q2. If the external review panel endorses the previous designations of the DOE laboratories into intramural and extramural groups, is DHS still committed to allowing each laboratory to determine which group it is in?

A2. The DHS Science and Technology Directorate, wishing to make the best use of DOE National Laboratories and sites in consonance with statute, regulation, and policy, asked laboratories and sites to make a decision regarding their desired mode of interaction with the Directorate—to participate in S&T's internal strategic planning and program development processes or, if otherwise permissible under applicable law, regulation, contract, and DOE policy, to respond to certain types of S&T solicitations open to the private sector.

On March 31, 2004, the following DOE National Laboratories and sites communicated their decision to Under Secretary McQueary to participate in S&T's internal strategic planning and program development processes: Argonne National Laboratory, Bechtel Nevada, Brookhaven National Laboratory, Idaho National Engineering and Environmental Laboratory, Lawrence Livermore National Laboratory, Los Ala-

mos National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, and the Sandia DOE National Laboratories. The designation of intramural/extramural is therefore no longer necessary for the nine laboratories and sites under consideration.

Q3. What particular steps will the DHS take to ensure that the appropriate Members and committees of Congress are informed of the activities and progress of the external review panel?

A3. The Science and Technology Directorate will remain available to brief appropriate Members and committees of Congress on the results of the external review and the findings of the Homeland Security Science and Technology Advisory Committee, which will be charged with advising the Department on options for establishing a long-term strategic relationship with the DOE National Laboratories and sites.

Q4. You testified before the Science Committee on February 11, 2004, that you "would be happy to share with [the Committee] what the criteria had been" in designating the DOE National Laboratories as intramural or extramural. But during a meeting with staff on February 24, 2004, Assistant Secretary Parney Albright said that DHS did not apply written criteria and did not assign numerical scores to the laboratories in its designations of the laboratories as intramural or extramural. Please explain the contradiction and provide the promised criteria.

A4. During the Fall of 2003, the S&T Directorate further defined its programs, stood up the Homeland Security Advanced Research Projects Agency (HSARPA) and Systems Engineering and Development (SED), established the roles and responsibilities for all of the offices within the S&T Directorate, and further refined what program areas were the unique (or majority) responsibility of the Federal Government to execute. Accordingly, the S&T Directorate developed the following criteria to further determine which laboratories are best suited to participate in activities involving strategic planning, program development, and stewardship planning:

1. Institutional culture and infrastructure dedicated to national security, which includes the ability to conduct classified programs and manage field intelligence elements;
2. Systems engineering capability and culture for transitioning research and development programs into fielded operational capability through partnerships with end-users;
3. Significant technical breadth and depth in the assigned mission area(s), including unique expertise, capabilities and assets; and
4. Ability to leverage other multidisciplinary programs to address mission requirements.

On March 31, 2004, the following DOE National Laboratories and sites communicated their decision to Under Secretary McQueary to participate in S&T's internal strategic planning and program development processes: Argonne National Laboratory, Bechtel Nevada, Brookhaven National Laboratory, Idaho National Engineering and Environmental Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, and the Sandia DOE National Laboratories. The designation of intramural/extramural is therefore no longer necessary for these entities.

Questions submitted by Representative Lynn Woolsey

Q1. Much of our attention is captured by the type of attacks we have seen in the Capitol complex in the last three years where there is a targeted release of a deadly substance (anthrax and ricin). These attacks are horrific and those exposed may become ill or even die, but this type of agent will not produce widespread effects to others in the community. I am worried about a different kind of attack wherein a virus or bacteria is modified and released into major population centers with the intent of seeing the disease spread to thousands or even millions of people.

What work is the DHS doing to develop the tools necessary to detect such an attack, diagnose the agent, and to react swiftly with effective and appropriate treatment?

A1. The Department of Homeland Security, through its National Biological Defense and Analysis Center (NBACC), has a major effort on providing the scientific data

to understand and prioritize biological threats—both current and emerging. One key element of this, done in collaboration with the National Institutes of Health (NIH), is to identify what are known as virulence pathways—the mechanisms that an organism uses to invade and attack its host. Even if an organism has been engineered, it must retain these virulence pathways to efficiently infect its host. Thus, an improved understanding of these pathways will lead to the development of medical countermeasures targeted against them and to a more robust defense.

A second key element, being executed as part of a coordinated interagency BioSurveillance Initiative, is to conduct continuous monitoring of the health of our Nation's population, livestock and plants and to combine this with environmental monitoring data on our cities, food, and water supplies. This continuous situational awareness is geared at giving the Nation the earliest possible indicator of a biological event—whether from traditional agents or from a new, and as yet unknown, agent.

A third element is the development of advanced detection systems and the associated bioassays. Bioassays allow the detector to "recognize" an organism as a threat. Current bioassays are largely targeted at unique features (genetic or protein) that distinguish the threat organism from look alike organisms and from normal "environmental" backgrounds. Several paths are being pursued to increase the capability of bioassays against engineered threats, including:

- Searching for "markers" of bio-engineering;
- Linking the unique signatures to known genetic and protein features that are critical to virulence; and
- By broad classification techniques, be able to determine that a new organism has features similar to already-characterized organisms.

Q2. The budget submission from DHS specifically mentions the effort to increase sampling coverage and frequency in urban areas—this is part of the $407 million for biological countermeasures. What is the range of biological threats this effort will try to detect? What technical hurdles stand between the Department and its goals? Again, in light of the kind of threat I mention above of a viral or bacterial agent, is the Department looking at establishing a sampling and testing system for public healthcare workers or other emergency responders who would be among the first to see the effects of a widespread biological attack?

A2. The Science and Technology Directorate remains committed to increasing sampling coverage and frequency in urban areas. The FY 2005 budget request includes $65 million for these activities and for developing next generation technologies.

More than half of these funds, $34 million, will be used to increase the number of collectors in the Nation's highest-threat cities. Another $17 million will be used to accelerate the research and development of the next generation of detection technology. The new detectors will be fully autonomous and capable of conducting both the sampling and collection in the field. This will significantly reduce the cost of the current system, which is dominated (?70%) by the labor costs associated with retrieving and analyzing samples. Furthermore, this technology will allow simultaneous detection of more than 20 threat agents, including some markers of genetic engineering.

The biggest technical hurdles are:

- Achieving a low false alarm rate of less than one in 100 million;
- Realizing autonomous operation capable of running 24/7/365 with only periodic routine maintenance;
- Incorporating biological assays that are robust against engineered organisms; and
- Ensuring low acquisition and sustainment costs on the order of $25,000 per copy to acquire and $10,000 per year to operate.

In deploying systems like BioWatch, the Science and Technology Directorate works closely with the Centers for Disease Control and Prevention (CDC) and with the local public health and emergency management offices where BioWatch is deployed. The local public health authorities establish the sampling and testing protocols for their healthcare workers.

Q3. Currently, I have been told that it takes an average of three years to develop a vaccine. Is anyone at DHS working on speeding up the time to develop a vaccine to something like, say three months or even three weeks? If you are not working on that, who in the government is working on the problem?

A3. The Department of Health and Human Services (DHHS) has the responsibility to develop medical countermeasures for the human population; however, the Department of Homeland Security advises on the development of medical countermeasures based on its threat information.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Phillip J. Bond, Under Secretary of Commerce for Technology, Department of Commerce

Questions submitted by Representative Bart Gordon

Q1. **TA—***Your testimony did not address any activities of the Technology Administration. Provide the Committee with five outcome-oriented accomplishments of the Technology Administration during the past year.*

A1. The Technology Administration (TA) was established to carry out the mission mandated by the *Stevenson-Wydler Technology Innovation Act of 1980.* That Act calls for conducting technology policy analysis to improve U.S. productivity, technology, and innovation. The Act lists areas for that analysis, including: the relationship between technology development and U.S. economic performance; the influence of economic and labor conditions, industrial structure and management, and government policies on U.S. industry; technological needs, problems, and opportunities that, if addressed, could make a significant contribution to the U.S. economy. It also calls for supporting policy experiments, encouraging collaborative research, stimulating interest in high technology careers, encouraging technology skills in the United States, and considering government measures with the potential to improve U.S. technological innovation. In addition, the *NIST Authorization Act of 1988* (Public Law 100–519) mandated that the National Institute of Standards and Technology, the Office of Technology Policy, and the National Technical Information Service all be a part of what comprises the Technology Administration. The following are some of the recent activities that contribute to TA's mission.

Advanced Technologies for Education and Training

More than 40 representatives of industry, academia, teachers, and public interest groups formally urged TA to lead an effort to foster next generation learning technologies. These technologies would enable: visualization, modeling, and simulation; virtual worlds; intelligent tutors and assessment tools; large scale digital libraries and on-line museums; distributed learning and collaboration; and new learning management tools. Studies suggest that these technologies, coupled with new cognitive science, could enable dramatic improvements in learning performance, speed to mastery, and higher levels of achievement, at lower cost. This could have profound effects on U.S. competitiveness and economic growth, and provide an important new advantage for U.S. workers in their competition for jobs against knowledge workers in other countries who are willing to work for less.

TA's leadership role was sought because many of the challenges related to developing and deploying these technologies are innovation challenges. *TA has primary responsibility in this area due to its mission and expertise in technological innovation, as established by the Stevenson-Wydler Act.*

In response to these calls for leadership, TA developed and established the White House National Science and Technology Council Working Group on Advanced Technologies for Education and Training, co-chaired by the Under Secretary for Technology. The Working Group has 17 federal departments and agencies as members, and has developed a two-pronged agenda. First, the working group will inventory and examine federal investments focused on the development of advanced technologies for learning. Second, under TA leadership, the working group developed an action-oriented innovation agenda focusing on: private sector investment and market development; organizational and systems change in education and training institutions; preparing people for new roles; building bridges for market responsiveness and technology transfer; and other factors that affect learning technology innovation. Since establishing the working group in October 2003, Under Secretary Bond has convened four townhall meetings with the education community and technology providers to gain a better understanding of the challenges and to solicit advice.

Establishment of the working group was praised in press releases from: the Software and Information Industry Association, Federation of American Scientists, National Association of State Universities and Land Grant Colleges in partnership with the Business-Higher Education Forum, Microsoft, and the Alliance for Science and Technology Research in America.

Biotechnology

US/OTP developed, fielded, and analyzed the first federal survey of the use of biotechnology in U.S. industry. This was a ground-breaking collaborative, interagency effort because, prior to development of this survey, no comprehensive official *United*

States Government (USG) statistics existed about the use and development biotechnology and its contributions to the U.S. economy.

The goals of the collaborative survey project were to:

- Develop estimates of the economic and industrial impact of biotechnology on U.S. industries and the national economy, as well as information about firms' economic performance, growth, trade, and markets; research and development; employment; interactions with the Federal Government; defense orientation; and perceived barriers to innovation and competitiveness.
- Test survey definitions, questions and process in order to provide information to federal statistical agencies (NSF and Census) as they develop collection methods for statistical measures for biotechnology products and processes.
- Demonstrate the United States Government's responsiveness to industry needs.

Surveys were mailed to 3,189 U.S. companies and responses were obtained from 70 percent of firms; 1,031 firms confirmed that they were performing biotechnology activities relevant to the assessment and provided sufficient data for analysis.

US/OTP's statistical analysis of the data (published in November 2003) has been used to inform policy-makers interested in capitalization of U.S. biotech firms (such as questions related to SBA guidelines for SBIR grants) and for workforce and biodefense-related issues. US/OTP currently is engaged in discussions with federal statistical agencies to encourage a second (revised) survey in order to begin to develop a USG longitudinal data series on this important new technology area.

Science and Engineering Workforce Trends

To support policy development directed at ensuring the Nation has an adequate supply of scientists and engineers to meet current and future demand, TA has conducted extensive quantitative and qualitative analysis of U.S. science and engineering workforce trends, including: recent occupational growth; salary growth; unemployment rates; educational preparation, including degrees earned by specialty, race, and gender; and projected job growth and job openings by occupation. TA staff has disseminated the results of this analysis through briefings to a wide range of groups:

- President's Council of Advisors on Science and Technology staff
- NSF STEM Pathways Conference
- Computing Research Association's Computing Leadership Summit and Board of Directors
- American Society for Engineer Education's Engineering Dean's Council
- Council of Scientific Society Presidents
- Staff of the U.S. Senate Committee on Commerce, Science and Transportation

Education and Training for Information Technology Workers

After extensive research and outreach to employers, labor, and the education and training community (involving outreach to more than 450 participants), TA published the ground-breaking *Report to Congress on Education and Training for the Information Technology Workforce.* This report includes extensive findings on the education, training, skills, and experience employers seek in IT workers. In addition, for the first time, the report lays out the complex education and training landscape that IT workers must navigate to acquire education and skills. As the IT labor market becomes more competitive and off-shoring of IT work increases, this report helps U.S. IT workers better understand the kinds of skills they need to be competitive in this labor market, and the types of education and training programs that offer such skills. This report also helps education and training providers better understand the IT knowledge and skills they need to provide to their students. TA analysts have also sought to disseminate the findings of this study by speaking at a variety of industry, academic and government fora. In particular, TA staff delivered presentations to three bidder's conferences held by the Department of Labor's Employment and Training Administration in support of its H–1B Technical Skills Training Grants program, as well as at its national grantees conference.

Nanotechnology/Converging Technologies

TA has taken a leadership role in the National Nanotechnology Initiative (NNI) to ensure that the insights and breakthroughs emerging from our substantial federal investments in nanoscience and nanotechnology research move into the commercial marketplace to provide economic growth, high-wage job creation, and social benefits. Through TA's development of and participation in outreach events such as

conferences and workshops, I have personally highlighted the need to proactively address societal and ethical concerns in order to lower possible impediments to development and commercialization of new products; the importance of moving research into the marketplace expeditiously; and encouraged increased participation by scientists and engineers in public education and discussion.

TA's efforts to support these messages and engage policy-makers in these issues include:

- Initiating a dialogue between industry and NNI leaders for senior officials of the Bureau of Industry and Security (BIS) on how nanotechnology may affect, and be affected by, export controls. This work led to a proposal by Secretary Evans to the President's Export Council for consideration of the formation of a nanotechnology subcommittee which would provide a structural mechanism to enable policy-makers to receive counsel from the private sector.
- Fostering greater dialogue and engagement between stakeholder groups-scientists, engineers, business leaders, venture capitalists, educators, ethicists, philosophers, other federal agencies—on issues affecting the development and commercialization of nanotechnology.

  Outreach efforts include working with federal, State and local economic development officials to spur awareness and adoption of nanotechnology as a tool for technology-led economic developments around the country. For example, in partnership with the National Nanotechnology Coordination Office, TA developed and led the first Regional-State-Local Nanotechnology Workshop for state economic development and technology leaders. More than 125 technology and economic development officials from 25 states and the District of Columbia participated in the conference.

  TA also is working to increase public understanding of federal efforts to ensure the responsible development of nanotechnology, including its impact on human health and the environment. For example, TA supported the development of the Converging Technologies Bar Association (CTBA), a non-profit organization focused on proactively identifying and addressing legal implications of converging technologies (nanotech, biotech, and IT).
- Increasing understanding among federal agencies of the status and implications of nanotechnology research and development, and the relationship of this new technology to their agencies' missions. For example, TA is working with workforce development officials at the U.S. Department of Labor to ensure the department's training programs include support for nanotechnology-based occupations.

Digital Freedom Initiative (DFI)

TA led the development of the Digital Freedom Initiative (DFI), a White House initiative announced in March 2003 by Secretary Evans. TA continues to lead the DFI, which has brought several federal agencies together with over 40 IT firms and organizations to promote technology partnerships and entrepreneurship as catalysts for economic expansion within developing economies. The goal of the Digital Freedom Initiative is to open new markets and create demand for U.S. high-technology products and services by promoting economic growth in developing countries—specifically by teaching the benefits of information and communication technology (ICT) to entrepreneurs and small businesses in developing countries. The DFI leverages USG leadership with the creativity and resources of over 90 U.S. businesses and non-profit organizations, together with the vision and energy of local entrepreneurs in host countries. U.S. business volunteers such as Hewlett-Packard, CISCO and other smaller firms are currently implementing programs in Senegal aimed at increasing IT capacities of small business in that country while at the same time creating new market demand for U.S. products and services. On October 16, 2003, President Bush announced that Peru and Indonesia have agreed to follow Senegal's lead and join the DFI partnership; Jordan is being considered as the next DFI partner.

U.S.-Israel Science and Technology Commission (USISTC)

The USISTC binational initiative advances collaborative and technological development, helps reduce impediments in the conduct of business, and promotes government and industry cooperation between the U.S. and Israel. The Commission's secretariat, the Technology Administration, worked throughout 2003–04 with a host of interagency S&T directorates, industry sectors, and Commission constituents to expand binational collaboration through a fast-paced agenda with a strong technology focus. Key outcomes and accomplishments include the issuance of a biotechnology

and life sciences RFP and subsequent $1 million grant award to a consortium of private sector biotechnology entities designed to foster bilateral development between the U.S.-Israeli biotech sectors; development of a U.S.-Israel cooperative program for civil infrastructure security (CIS) leveraging expertise and resources for R&D, technology assessment and demonstrations of innovative utility sector technologies; implementation of a demonstration project in partnership with Israel's Ministry of Environment and the White House Office of the Federal Environmental Executive (OFEE) that will advance integration of environmental and security management systems to enhance security preparedness in the public and private sectors; and, organization of a Nanotechnology Roundtable of U.S.-Israeli experts to help analyze potential high technology collaborations.

Memorandum of Understanding (MOU) with the Russian Ministry of Education and Science

In response to an agreement reached at Camp David in October 2003 by President Bush and President Putin to cooperate on high technology matters, OTP and the Russian Ministry of Education and Science (MES) worked to negotiate an MOU to promote S&T Cooperation in Technology and Innovation. The MOU was signed on April 19th by U.S. Secretary of Commerce, Don Evans and Minister Andrey Fursenko/MES. OTP's next activities will follow up recent discussions between Minister Fursenko and Under Secretary for Technology Phillip Bond on appropriate Terms of Reference (TOR) for an Innovation Council on High Technologies. The Council will serve as the mechanism to achieve goals defined in the MOU and will focus on identifying and addressing technological, legal and financial issues that impact the ability of U.S. and Russian private and public entities to form partnerships and establish commercially oriented programs to serve the international market place.

Technology Transfer

OTP's activities were guided by statutory requirements and requests for resident expertise. Recent activities include:

- Preparation of the statutory annual report (under the Technology Transfer Commercialization Act, P.L. 106–404) on the technology transfer activities of Department of Commerce federal laboratories (NIST, NOAA, NTIA) in FY 2003.
- Collaboration with OMB (summer 2003 and March 2004) to develop detailed guideline materials for federal agency preparation of statutory (see above) annual reports on federal lab technology transfer. TA/OTP language incorporated in OMB's Circular A–11 of July 2003; revisions for the new fiscal year to be incorporated in the forthcoming July 2004 edition of Circular A–11.
- Provided preliminary statistics to the Congress (April 2004) on technology transfer activities through FY 2003 of the federal labs across ten federal departments. This information is assembled and analyzed by TA/OTP (consistent with OMB's Circular A–11 guidelines—see above) as part of the preparation of the next edition of the Secretary of Commerce's Summary Report on Federal Laboratory Technology Transfer (also statutory under the Technology Transfer and Commercialization Act).
- Worked with the federal agencies (through the Interagency Working Group on Technology Transfer—chaired by TA/OTP) and others in the technology transfer community to provide information and comment on drafts of the recent evaluation report by the President's Council of Advisors on Science and Technology (PCAST) on "Technology Transfer of Federally Funded R&D." PCAST's report was transmitted to the President in May 2003. TA/OTP's coordinated activities significantly enriched the findings and proposed actions discussed by the report.
- Organized subcommittee of the Interagency Working Group on Technology Transfer (chaired and coordinated by TA/OTP) to work with the Department of Commerce's Office of General Counsel to prepare revised regulations for federal invention licensing (37 CFR Sec. 404). Revised version of licensing regulations to be published in Federal Register summer 2004 (estimated).

State S&T Indicators Issued

TA released *The Dynamics of Technology based Economic Development: State Science & Technology Indicators, 4th edition,* which tracks changes in values of metrics for up to ten years. The State Science and Technology Institute (SSTI), representing a nationwide network of state practitioners and policy-makers, has confirmed that the report is used extensively by those in the public and private sectors

concerned with regional innovation and competitiveness. Findings include: for the 2001–2002 time period for the number of U.S. patents issued per 10,000 business establishments, Idaho was ranked first, followed by California, and Vermont; for number of engineers employed per 10,000 civilian workers, Washington state was first, followed by Massachusetts, and Kansas; and for the average annual number of Small Business Innovation Research awards per 10,000 business establishments, Massachusetts was first, followed by New Mexico, and Maryland.

Facilitating Federal Laboratory Participation in Economic Development

A Technology Administration report, which was highlighted by the Economic Development Administration, identified the best practices of seven federal laboratory partnerships and two intermediary programs in working with entrepreneurs, local business groups, and higher education to support technology-led economic development. The report, *Partners on a Mission: Federal Laboratory Practices Contributing to Economic Development,* provided national exposure to a set of innovative lab practices that can be used by communities to support innovation, technology transfer, to create new jobs, products and services. Key findings of the report were: technical and entrepreneurial assistance, now a peripheral activity for most government labs, can be very beneficial to the labs technology transfer mission; mentor protégé programs encourage small business partnering and help strengthen suppliers; entrepreneurial leave programs can be valuable mechanisms for promoting commercial use of laboratory technology; some federal laboratories are effectively sponsoring entrepreneurial, seed and venture capital and business networking events, and; research parks and incubators set up by federal labs were more effective in attracting research companies and suppliers when the public-private linkages were facilitated by economic development organizations.

Collaboration with National Association of Seed and Venture Funds (NASVF)

(Ongoing) TA is working with NASVF to support local efforts to create angel investor networks through one-day workshops, designed by nationally known business and economic development professionals, on how communities have used team-based approaches for supporting local entrepreneurship and networking sources of capital. Rationale for TA's approach is that most states are involved in supplying or catalyzing the formation of a variety of risk capital to support local technology business growth. Outcomes include: Communities involved have reported an energized local seed investing market, more effective networking of local investors interested in technology-based companies, and greater resources for the local knowledge-based economy.

Telehealth

The Technology Administration began an initiative to analyze innovation, demand and investment in telehealth resulting in the following accomplishments: a partnership between the American Telemedicine Association and NIST to develop initial standards for diabetic retinopathy; identification of homeland security applications for telehealth networks; increased telehealth technology and services exports through trade missions to Colombia, Ireland and the U.K.

Assistive Technologies (AT)

In support of the President's New Freedom's Initiative, TA is leading an eight-point Department of Commerce initiative to support the development of assistive technologies and to promote the U.S. assistive technology industry. The Secretary of Commerce began the initiative through the Technology Administration to identify, understand and support innovation, growth and investment in assistive technologies. This initiative has resulted in the following to date: established positive working relationship with AT industry, including establishment of relationship with NIST for manufacturing and standards services; convened policy roundtable for the broad range of AT stakeholders; facilitated dialog between AT industry and federal AT research centers; collected and compiled international market data for 10 countries and reviewed foreign trade policies for unfair practices; included AT industry in export promotion events.

Q2. **SBIR—***OMB has labeled 13 federal programs as failures, including the Small Business Innovation Research (SBIR) program at the Department of Commerce (*Washington Post, *11 February 2004). A review of the Program Assessment Rating Tool (PART) finds fault with the Department of Commerce management of the program and implies criticism of the legislation establishing the SBIR program. NOAA and NIST manage Commerce's SBIR program. What steps will these two agencies be taking in response to the PART analysis? What are the shortcomings that the Administration finds with the SBIR legislation?*

NIST Answer. OMB applied the Program Assessment Rating Tool (PART)—a programmatic evaluation tool—to the individual offices charged with administering the program within DOC. As a result, OMB found the overall management of the individual SBIR programs effective but had concerns in the areas of program rationale, program planning, and results. NIST has a strategic plan in place for its SBIR program that focuses on improving efficiency and effectiveness and developing performance measures to gather customer satisfaction data from the small businesses participating in the SBIR program. While NIST is working to adopt these improvements, progress may be limited due to resource constraints. Funds allocated to the SBIR program are for the exclusive purpose of funding SBIR awards and cannot be used for the administration of the program or the implementation of evaluation methods.

The major issues involve program purpose and design. OMB states that the SBIR program is redundant of other federal programs. In addition, OMB finds that the design of the SBIR program (a mandatory "tax" on R&D programs) reduces agencies' flexibility by restricting their investment decisions. These program requirements are mandated by the law.

NOAA Answer. The NOAA Office of Research and Technology Applications (ORTA) manages the NOAA component of the DOC program under the auspices of the Small Business Administration. NOAA's goal, which is consistent with Small Business Innovation Research (SBIR) legislation, is to enhance small business research and development and to stimulate economic growth. It is the function of the NOAA SBIR Workgroup, which is comprised of one representative from each Line Office, to develop and submit to ORTA research topics that advance and are consistent with NOAA's mission and strategic plan.

The only aspect of the PART scoring of the NOAA SBIR Program under ORTA's control is the management portion, of which NOAA received a high score.

Q3. **MEP—***The Administration's request for the Manufacturing Extension Program is only one-third of what is required to maintain the existing network of MEP centers. What will be the impact of the Administration's funding request on the level and amount of services provided to small manufacturers? For example in FY03, MEP served more than 18,000 clients. With only $39 million, how many small manufacturers will be served and what will be the economic impact?*

A3. Since its inception as a pilot program in 1988, the Manufacturing Extension Partnership (MEP) has provided many small U.S. manufacturers with useful business services to become more competitive and productive. MEP's nationwide network serves to promote lean manufacturing techniques such as zero-defect quality programs. The program makes it possible for even the smallest firms to tap into specialists from across the country with manufacturing and business expertise in plant operations and on manufacturing floors. MEP clients have experienced more growth in labor productivity over a five-year period than similar non-client firms. MEP was originally intended to be comprised of 12 federally supported centers, with federal funding ending after six years. In its 15 years of operation, the program has expanded away from this original design to include 400 locations, and Congress has removed the sunset provision. Funding for the MEP centers is a cost-sharing arrangement consisting of support from the Federal Government, State and local government, and the recovery of fees for services. Given advances in manufacturing and technology, it is appropriate to evaluate MEP operations and take steps for continuous improvement.

While the President's request is a reduction from historical levels, it maintains the level of funding appropriated in FY04. To improve the effectiveness of the program at these reduced levels, the Administration proposes to coordinate MEP fully with other Commerce Department programs that are helping manufacturers to be more competitive and expand markets. Through this coordination, the Commerce Department can more closely link the technical and business staff employed by the MEP centers located around the country with trade promotion specialists in the Commerce Department's International Trade Administration. In addition, the ITA has experts with in-depth knowledge of various sectors of industry. MEP field agents and these sector experts, the program can be a more effective national resource to help small manufacturers compete and succeed in the global marketplace. Additionally, MEP will hold a re-competition, with a focus on effectiveness and cost-efficiency.

Q4. **MEP—***The President's manufacturing initiative states that there will be a re-competition of all MEP centers that will focus on improving effectiveness and efficiency. What steps has the Administration taken to improve the effectiveness and efficiency of MEP centers during the past three years? Or is this re-competi-*

tion just a way to cut the number of centers to fit within the Administration's budget request? What are the new selection criteria for the re-competition? If you can't answer this question now, when will you be able to? What should Centers and States do in the interim while the Administration develops its re-competition criteria and what does this mean for federal funding to existing Centers?

A4. During the last year, the Department took a comprehensive look at the issues influencing the long-term competitiveness of U.S. manufacturing to identify the challenges our manufacturers face and outline a strategy for ensuring that the government is doing all it can to create the conditions that will allow U.S. manufacturers to increase their competitiveness and spur economic growth. That review ultimately lead to the recently-released U.S. DoC Manufacturing Report. As a result of these efforts, and reduced funding levels enacted in FY04, NIST plans to implement the following MEP operating plan:

1. Redefine all existing cooperative agreements with current MEP centers through Fiscal Year 2004.

- Continue FY 2003 levels of funding support for centers—with month-to-month commitments—through September 30, 2004. By carefully managing FY 2004 funds, this approach can sustain the existing center system through the fiscal year with the current appropriation because of the staggered basis upon which centers have been funded to date (most centers will be operating on FY 2003 funds through June 30, 2004).
- Centers are not obligated to accept the month-to-month funding and can choose to discontinue efforts at any time.

2. Conduct a full and open competition to establish a program that maximizes service impact at the reduced program level in Fiscal Year 2005.

- Hold a re-competition for MEP centers in the fall of 2004. This timing will allow the Department to solicit and receive input from state co-investors in the MEP centers. Because MEP is a cost shared program relying upon the contributions from its State partners ($\frac{1}{3}$ of the total center funding), it is critical to get their input in defining the format and structure of the re-competition. This is essential to assure state support for the re-competition and to encourage states to support proposals for well-qualified, well-financed centers.
- MEP will conduct a series of regional discussions to get state and other investor inputs in the July/August 2004 timeframe. NIST will release a Federal Register notice requesting proposals on or about September 1, 2004, with proposals due October 31, 2004 (60 days later). Awards are expected to be effective January 1, 2005.
- The center competition will use the criteria and protocols as established in the MEP rule (15 CFR 290).
- Aggregation of service entities will be encouraged to maximize leverage of limited funding, including regional centers.
- The concepts identified in the recent Department of Commerce Manufacturing Report will be implemented.
- MEP will implement, as appropriate, any proposed program reforms in the upcoming National Academy of Public Administration (NAPA) analysis of the MEP program.
- Centers will be expected to use the limited federal resources to support the delivery of services to small manufacturers and limit their expenditures on administrative functions.
- MEP will provide software and other standard approaches to support center operations.
- Per their request, centers and state economic development offices will be given opportunities to provide input on the re-competition.

3. Discontinue any center support and stewardship activities that are no longer relevant.

- Center annual reviews and panel reviews will be discontinued as appropriate.
- Contracts and procurements associated with center support that is no longer needed will be terminated for convenience.

4. Begin internal staffing analysis and reductions.

- MEP and NIST have received Voluntary Early Retirement Authority (VERA) and buyout authority.

- MEP and NIST will begin Reduction-In Force (RIF) processes as needed after VERA and buyouts are applied.
- MEP will implement the reduced level of program support and NIST will implement the reduced level of administrative overhead once the RIF is completed.

The evaluation criteria that must be used for the re-competition are specified by the MEP governing regulation, 15 CFR 290. These criteria are equally weighted and are as follows:

- Identification of Target Firms in Proposed Region. Does the proposal define an appropriate service region with a large enough population of target firms of small- and medium-sized manufacturers that the applicant understands and can serve, and which is not presently served by an existing center?

  Market Analysis. Demonstrated understanding of the service region's manufacturing base, including business size, industry types, product mix, and technology requirements.

  Geographical Location. Physical size, concentration of industry, and economic significance of the service region's manufacturing base. Geographical diversity of the centers will be a factor in evaluation of proposals.
- Technology Resources. Does the proposal assure strength in technical personnel and programmatic resources, full-time staff, facilities, equipment, and linkages to external sources of technology?
- Technology Delivery Mechanisms. Does the proposal clearly and sharply define an effective methodology for delivering advanced manufacturing technology to small- and medium-sized manufacturers?

  Linkages. Development of effective partnerships or linkages to third parties such as industry, universities, nonprofit economic organizations, and State governments who will amplify the center's technology delivery to reach a large number of clients in its service region.

  Program Leverage. Provision of an effective strategy to amplify the center's technology delivery approaches to achieve the proposed objectives as described in 15 CFR 290.3(e).
- Management and Financial Plan. Does the proposal define a management structure and assure management personnel to carry out development and operation of an effective center?

  Organizational Structure. Completeness and appropriateness of the organizational structure, and its focus on the mission of the center.

  Program Management. Effectiveness of the planned methodology of program management.

  Internal Evaluation. Effectiveness of the planned continuous internal evaluation of program activities.

  Plans for Financial Matching. Demonstrated stability and duration of the applicants funding commitments as well as the percentage of operating and capital costs guaranteed by the applicant. Identification of matching fund sources and the general terms of the funding commitments.

  Budget. Suitability and focus of the applicant's detailed one-year budget and budget outline for years 2–5 and beyond.

Q5. **MEP—***It has been suggested that the Administration wants to develop a network of regional MEP Centers. How would movement to a network of a few regional centers affect the current cost-share (⅓ federal, ⅓ State and ⅓ service charges)? For example, if there were a Midwest regional center, how would State funding be apportioned? Have you discussed any of these scenarios with the States, which are equal partners with the Federal Government in the program? In general, what discussions have you had with States regarding the Administration's vision for the MEP? If you have not had any discussions, when do you intend to consult with the States?*

A5. Because MEP is a cost shared program relying upon the contributions from its State partners (⅓ of the total center funding), many of which have been active for most of the past decade and some since the late 1980s, it is critical to get their input in defining the format and structure of the MEP and re-competition. This is essential to assure state support for the re-competition and to encourage states to support proposals for well-qualified, well-financed centers. NIST/MEP is planning to conduct a series of regional discussions to get State and other investor inputs in the July/August 2004 timeframe.

Q6. **Voting Systems—***During the past year there have been numerous reports of problems with electronic voting systems. The Department of Defense recently scrapped its plans for Internet voting. There have also been widespread calls for better standards for electronic voting equipment. Under the Help America Vote Act, this committee ensured that NIST would have a role in the development of voting system standards. NIST has been working with state officials this past year in a very limited way on this issue. Why didn't the Administration consider this a priority for NIST and request funding for NIST voting standards efforts?*

A6. Tight budget constraints and the Administration's priority on the war on terrorism prevented an appropriation request for activities under the Help America Vote Act in NIST's Fiscal Year 2005 Budget request. NIST is devoting $375,000 on voting standards and technology-related funding in FY 2004. The Administration is, however, exploring the possibility of NIST's providing services to the TGDC via a Memorandum of Understanding with the EAC. That could provide a source of funds for NIST in FY 2005.

Q7. **Mr. Gordon's Questions—***Please respond to Mr. Gordon's questions at the hearing:*

Q7a. If the Administration's proposal to eliminate ATP funding in FY 2005 were enacted, what would the contractual and transition costs in FY 2005 be and would these costs be absorbed by the NIST budget?

A7a. If Congress enacts the FY 2005 President's Budget proposal to terminate funding for the Advanced Technology Program (ATP), the Department of Commerce and NIST will pursue all available means to address the termination cost requirements, consistent with legal obligations and sound management practices. To the greatest extent possible, NIST will seek opportunities to place ATP staff elsewhere in NIST or at other agencies, both within and outside the Department. NIST already has received VERA and buy-out authority to reduce the number of its employees in light of the lower appropriation level for other programs in FY 2004. The use of funding that may become available through prior year deobligations in ATP is also a possibility to offset ATP shutdown costs. Prior year deobligations have averaged $13 million over the last three years, although a lower level is projected for FY 2005. Finally, the Department may be able to use special transfer authority to cover ATP termination costs if the FY 2005 appropriations bill contains the requested provision comparable to Section 205 of the General Provisions applicable to the Department in the Consolidated Appropriations Act, 2004.

Q7b. If the FY 2005 MEP budget were enacted, what impact would it have on the States?

A7b. As a result of the findings in the U.S. DoC Manufacturing Report, and the reduced funding level provided in FY 2004, the the Administration has just recently finalized the implementation plan outlined above. Until the individual Centers give us specific information or the planned re-competition of Centers can be held, it is hard to determine which states will continue to provide a third of the funding support to the MEP system.

Q7c. Which agencies, companies, or foundations are volunteering to invest in the MEP program?

A7c. Negotiations are underway with a variety of federal programs which could capitalize on MEP's unique access to the small manufacturing marketplace. These opportunities include the following:

Department of Defense: utilize MEP to assist in overcoming critical defense production needs, identification and transfer of technologies with defense application, streamline defense supplier networks, etc.

Department of Homeland Security: assist in outreach to manufacturers and supplier networks which are part of the Nation's critical infrastructure, assessment of vulnerabilities and contingencies to address disruption in the Nation's supply system.

Department of Labor: assist in training and development of the 21st century workforce particularly in emerging manufacturing and technology sectors.

Department of Commerce: provide assistance and outreach in conjunction with the proposed Manufacturing & Services directorate within the International Trade Administration as a critical linkage to the Nation's smaller manufacturers for the purpose of policy development. In addition, TA and EDA recently signed a Memorandum of Understanding by which EDA will make available a limited amount of

FY 2004 economic adjustment assistance funding in support of existing NIST-funded MEP centers. Subject to EDA's eligibility and program requirements, MEP centers will be able to apply for an estimated aggregate of $5 million of such funding.

MEP has also considered foundation-type funding which is typically raised as principal to be kept intact, while the earnings from the principal are used to capitalize activities. For MEP to develop a steady stream of funding of any significance to substitute for some of the federal funding, the foundation would need to be capitalized at $400 to $500 million to prevent rapid depletion.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Raymond L. Orbach, Director, Office of Science, Department of Energy

Questions submitted by Chairman Sherwood Boehlert

International Thermonuclear Experimental Reactor

Q1. At the hearing, in response to a question about the total life-cycle cost of the International Thermonuclear Experimental Reactor (ITER), you stated, "I can assure that, not only will our contribution be capped at the current level, but I can also tell you that the baseline level of performance objectives will be maintained so that the baseline will follow current projections." When you spoke of the U.S. contribution being capped at the current level, were you referring to the percentage of costs that would be covered by the U.S. or a specific dollar amount in current dollars? If the latter, at what dollar level is the U.S. contribution capped? Can you be more specific about what you meant when you referred to the level of performance objectives? Has there been any discussion of adjusting the level of performance? Do we have any indications that the overall cost of ITER (not just the U.S. portion) has increased or will increase?

A1. The total U.S. contribution to the construction, operation and decommissioning of the ITER project is capped at a specific dollar amount. This amount is an essential element of our negotiating mandate and, as such, should not be discussed in public. The amount is consistent with a share of approximately 10 percent of the costs, the same as the other non-host participating Parties. Regarding the level of ITER performance objectives, there are no plans to change the objectives contained in the ITER Final Design Report of 2001. Since then, minor design changes have been considered by the transition design team; however, there is no indication of any net cost increase.

Science Laboratories Infrastructure

Q2. The budget request would cut funding for science laboratories infrastructure nearly in half and you have told us that you hope to address the most urgent infrastructure needs through third party financing.

Q2a. Under this approach, what specific measures do you plan to put in place to ensure that governmental goals drive the construction of new infrastructure, rather than the needs and desires of third parties to generate business?

Q2b. Third party and lease-back arrangements, although initially less costly, often result in higher costs to the government over the life of the facility. What kind of bargaining leverage does the government have to ensure that these facilities have a lower cost to the taxpayer?

A2a,b. All new capital asset projects with a total project cost of $5 million and above, including those that might be third-party-financed projects, are subject to DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets.* This Order and the accompanying Manual—which embody the capital asset principles and budget scoring guidelines set out in OMB Circular A–11—delineate a staged approval process that includes an assessment of mission need followed by an alternative analysis before selecting a strategy for addressing that mission need. This is the method that the Department will use to ensure that governmental goals drive such projects. Also, the Department's Office of Engineering and Construction Management is currently in the process of developing additional guidelines (as an addendum to Order 413.3) to address issues unique to alternative financing mechanisms.

Alternative financing is intended to be the exception rather than the rule, and projects must make good business sense for the government while being attractive to the private sector. The Department supports the Administration's position, as set out in OMB Circular A–11, that public-private partnerships should be used only when they are the least expensive method, in present value terms, to finance construction or repair. DOE Order 413.3 requires that several options for the acquisition of a proposed project be compared based on the total life-cycle-cost of each option. In the event that third party financing with a lease-back to the government is selected as the lowest life-cycle-cost acquisition strategy, then the resulting lease-back will include a one-year cancellation clause to ensure that the government will have the flexibility to address changing needs.

New Facility Starts in a Flat Budget

Q3. The Administration's budget projections indicate that it is unlikely that your Office's budget will receive significant increases in the near future, yet the budget proposes that work on three new projects begin in fiscal 2005. What impact will those projects have on the budgets of ongoing programs in your Office in the coming years? In the past, you have said that using existing laboratory facilities more fully is a higher priority than new starts. Doesn't the proposed budget run counter to that statement? Given the tight budgets, at what point will you have to reassess the facilities plan you recently issued?

A3. Both scientific opportunity and mission need demand that new activities be started even in difficult budget times. The Department has made various levels of commitment to three important new facilities in FY 2005: a new construction start for the Center for Functional Nanomaterials (CFN) at Brookhaven National Laboratory; long-lead procurement activities for the Linac Coherent Light Source (LCLS) at the Stanford Linear Accelerator Center; and, project engineering design on the Production and Characterization of Proteins and Molecular Tags facility. The LCLS activities are construction related, but the Proteins and Molecular Tags facility activities are only design related and do not commit the Department to moving forward with construction of the project. The budget places a high priority on existing facility operations, and increases both overall funding and operating time—as a percentage of optimum capacity—for the Office of Science's facilities.

As described in our budget submission, each of these proposed new facilities will enable outstanding, transformational science; will be a major resource for the science communities that we serve; and will advance the missions of the Department of Energy. Continuous renewal and reinvention are necessary if we are to maintain our world leadership position in science and in the technology that is enabled by it. The choices that we have put forward in our FY 2005 budget submission strike a balance between the stewardship of our existing facilities and the renewal and reinvention that will ensure a bright future.

Questions submitted by Representative Bart Gordon

Q1. **Hydrogen—***Last week, the National Academy of Science concluded that many of the Department's goals for a hydrogen economy were "unrealistically aggressive." Specifically, the report concludes that effects of hydrogen cars on oil imports and* greenhouse gas emissions *over the next 25 years "are likely to be minor."*

Q1a. Doesn't this suggest that the Administration's strategy for automotive emissions should be reconsidered?

A1a. The National Academies' report does not characterize the goals of the Hydrogen Fuel Initiative itself as "unrealistically aggressive." Instead, the report used that description in referring to particular near-term Departmental milestones, including fuel cell durability, component costs and on-board storage. These milestones are indeed aggressive but are not unrealistic in our opinion. In fact, given the technical challenges ahead, these interim milestones must be aggressive to stimulate innovative R&D approaches. To ensure milestones are realistic, they are continuously evaluated in close consultation with our automotive and energy industry partners and can be adjusted as necessary or appropriate. Reconsideration is a regular part of the Initiative's ongoing adjustment processes. The Department agrees that the effects of hydrogen cars on oil imports and greenhouse gas emissions over the next 25 years may indeed be minor. Goals of the President's Hydrogen Initiative include a commercialization decision by 2015, followed by vehicles available for purchase by 2020. Because growth in market share is typically gradual, and because it will take approximately 20 years to replace the vehicle population, full realization of the benefits of hydrogen vehicles is not anticipated until 2040.

However, this timeline illustrates why it is so critical to work on hydrogen-related technologies now to achieve resulting energy security benefits. The timeline for market introduction and transition included in the National Academies' report closely matches that of the Initiative. We believe that the overwhelmingly positive overall nature of the report, combined with a vision for market introduction similar to the vision of the Initiative, constitutes an endorsement of the Initiative's strategy.

Q1b. Does this suggest that the Bush Administration's shift in R&D funding from hybrid vehicles (which will reduce emissions significantly in the next 25 years) to hydrogen vehicles was a bad idea?

A1b. The Department invests in a balanced portfolio of R&D, including R&D on short- and mid-term transportation technologies as we transition to a hydrogen economy. The Department is actually proposing a $6.8 million increase in its FY 2005 request over FY 2004 appropriation levels in the area of advanced hybrid and electric drive technologies. These technologies can be applied in the near-term to gasoline-electric and diesel-electric hybrid vehicles as well as fuel cell vehicles as we transition to a hydrogen economy in the long-term.

Facilities Plan

Q2. The President's budget request for the Office of Science effectively leaves your budget flat in real dollars for the fifth year in a row. In November the Department issued a report entitled Facilities for the Future of Science, A Twenty-year Outlook, *ranking the major science facilities that need to be built over the next twenty years. No estimated costs were included in this report but one illustration shows that funding would have to ramp up and stay ramped up over virtually the entire period. With a flat budget, how can the Department successfully carry out this 20-year plan?*

A2. The 20-year facility plan, which is not a budget document, reflects an optimistic view of the future of the Office of Science. Affordability of these facilities will depend upon many factors in the future. In the FY 2005 request, funding is provided for the top five facility priorities in the plan as follows: ITER $7,000,000; Ultrascale Scientific Computing Capability $38,212,000; Joint Dark Energy mission $7,580,000; Linac Coherent Light Source $54,075,000; and Protein Production and Tags $5,000,000. If the multilateral negotiations are successful, ITER construction is expected to begin in FY 2006. The Ultrascale Scientific Computing Capability is not a traditional facility, and some research and development was already started in FY 2003. Formal construction start decisions for the Linac Coherent Light Source and the Protein Production and Tags facility will be considered as a part of the normal process for preparing the President's future budget requests. We consider the above facilities to be near-term priorities for the next decade.

DOE Earmarks

Q3. The Department has complained about the level of congressionally directed funding, or earmarks, in the FY04 budget and has produced statistics showing substantial increases in earmarks over the last several years, especially in certain programs.

Q3a. What is your definition of an earmark?

Q3b. The Administration complains a lot about earmarks. What is being done to diminish the effect of earmarking (for example, competing the contract)? Are you working with the earmarked institution to enable work consistent with DOE'S missions, or do you simply write a check?

A3a,b. An earmark is an activity called out by Congress for funding that was not requested in the President's budget by the Department (DOE).

To help reduce earmarks, all of our research with the university community is competitively awarded. Our laboratories widely advertise unique capabilities available to the private sector and compete opportunities to partner with the university community.

DOE is constrained by the conference agreement report language directing funds for the specified earmarked activity which may or may not directly contribute to DOE missions. Wherever possible and appropriate, DOE staff work diligently with the earmarked institutions to verify that the funding to support the proposed activity is within the scope of the Congressional direction. The award is made based on the determination for noncompetitive financial assistance following DOE guidelines.

Lab Infrastructure

Q4. A persistent concern at the National Labs has been aging infrastructure. Some buildings and facilities date back to World War II, and some still in use were constructed as temporary buildings.

Q4a. How much money does the President request for renovation, rehabilitation and demolition of these facilities that have continued in service well beyond their useful life?

Q4b. Are there facilities still in service that pose a danger to lives and adjacent property and if so, what is being done to eliminate these threats?

A4a,b. The President's request includes $22,927,000 under the Office of Science (SC) Science Laboratories Infrastructure (SLI) program for renovation, rehabilitation, replacement and demolition of aging facilities at SC's laboratories. The applicable construction and demolition activities in the FY 2005 SLI budget are shown in a table I would like to insert for the record. The information follows:

	FY 2005 Request (B/A in 000s)
Ames Laboratory, Excess Facilities Disposition	150
Argonne National Laboratory, Excess Facilities Disposition	2,120
Brookhaven National Laboratory	
Research Support Building Phase I Construction	4,458
Excess Facilities Disposition	300
Fermilab, Excess Facilities Disposition	125
Lawrence Berkeley National Laboratory	
Building 77 Rehabilitation Phase II construction	4,825
Excess Facilities Disposition	1,360
Oak Ridge Operations Office, Oak Ridge Landlord	736
Oak Ridge Institute for Science and Education, Excess Facilities Disposition	565
Oak Ridge National Laboratory, Excess Facilities Disposition	780
Stanford Linear Accelerator Center	
Safety & Operational Reliability Improvements Construction	7,108
Excess Facilities Disposition	400
Thomas Jefferson National Accelerator Facility, Continuous Electron Beam Accelerator Facility Addition – Phase I Construction	0
Total	22,927

Note that the Brookhaven National Laboratory (BNL) Research Support Building Phase I and Thomas Jefferson National Accelerator Facility (TJNAF) Continuous Electron Beam Accelerator Facility Center Addition are new buildings that replace 38,400 square feet of existing space that can no longer be economically maintained.

Regarding the concern that there may be facilities still in service whose condition may pose a danger to lives and adjacent property, we are confident that our systems and processes have identified any such facilities and they have been removed from service pending rehabilitation, renovation, or removal. The primary management process is the clear assignment of landlord responsibility within each laboratory for all facilities at the laboratory. Landlord divisions or departments have facilities managers who are fully knowledgeable in daily use and operation and have access to laboratory wide facilities management and environmental, safety, and health staff to support review and analysis of any issues of concern.

A secondary check is the condition assessment survey required on all facilities at least once every five years. These surveys are generally conducted by outside contractors or an independent facilities group at the laboratory. Survey results establish the condition of each facility and this information is entered into the Facility Information Management System (FIMS), the DOE corporate facilities management system.

Thirdly, using FIMS and periodic walk-throughs, the Site Office monitors those facilities that fall in the "poor" or "fail" category and reviews the corrective actions planned.

Strategic Plan for Science

Q5. You stated in your prepared testimony that the Department's updated Office of Science Strategic Plan will be fully integrated with the twenty-year facilities plan. What budget increases, over and above the requirements to carry out the

facilities plan, do you do you expect to be requesting to fully implement the Strategic Plan?

A5. Our strategic plan does not contain funding projections but it does outline an ambitious agenda for scientific discovery and leadership.

FutureGen

Q6. **FutureGen—***The Department is making a major commitment towards the funding of the FutureGen, a project that holds the promise of an essentially emission-free coal-burning electric power plant within the next 20 years. What progress do you expect to make during this Fiscal Year towards making a decision on where the project will be located?*

A6. There are several steps that we will follow in making a decision on a site for the FutureGen project. The Department is currently completing internal management review requirements for FutureGen and continuing to coordinate with the applicable committees concerning the program plan called for in the Conference Committee Report (H.R. 108–330). Once we have that process complete and once the FY 2004 funding for FutureGen is made available, the Department can begin negotiations with an industry partner. We forecast awarding the cooperative agreement in the late 2004 time frame. After release of funds in FY 2004, the Department will immediately begin its NEPA process for FutureGen. Once the negotiations are complete, the first priority is to develop a set of technical siting criteria that will be used in an open, fair, and transparent process.

Proposed sites will be qualified for consideration based on the technical criteria as well as on NEPA. Qualified sites will be further evaluated on the technical criteria in parallel with the NEPA process for the project. Upon completion of the NEPA process, formal site selection will be made based on NEPA and site evaluation criteria. This will take about two years from the time a cooperative agreement is awarded.

Fusion Funding

Q7. Funding for the International Thermonuclear Experimental Reactor (ITER) has increased substantially in this request—by $30 million—while the Fusion Science program has only increased slightly. One of the ongoing concerns of the fusion community has been that ITER should not cannibalize the base program. What cuts do you expect to make in the base program to fully fund the U.S. commitment to the ITER project in this fiscal year? Do you expect to restore funding to the base program or is the Department now embarking on a course of subsuming the base program as funding requirements for ITER grows?

A7. The FY 2005 funding provides $7,000,000 for specific ITER-related activities such as assigning engineers to the International Team and qualifying equipment vendors. The rest of the $38,000,000 involves redirecting the focus of our fusion research program toward support of ITER. For example, our tokamak experiments, although operating for fewer weeks in FY 2005, will focus their program on science issues needed by ITER. This refocusing is slight, since the major world tokamaks were already doing science of relevance to ITER, but significant, in that research will now be coordinated world-wide through the International Tokamak Physics Activity, with a focus on specific, detailed, ITER needs.

Similarly, our long range component development program will be closed out in an orderly fashion in FY 2004 and the resources will be redirected to support research on those components needed for our contributions to ITER, as well as for our ongoing experiments. Fusion advanced computing funding of $3,000,000 is also being redirected to fund ITER-relevant simulation efforts.

Given these shifts, there will be some dislocations and staff reductions in the program. Some of these reductions may be mitigated as we conduct competitions for various parts of the program in FY 2004. However, as the National Research Council report on Burning Plasma Physics concluded, we no longer have a domestic program and an ITER program. We have a single integrated fusion program that includes ITER.

Oil and Gas R&D

Q8. The budget requests for the oil and gas R&D program continue to decline year-after-year while oil and gas production in this country continues to decline at a rapid rate. The U.S. is dependent on oil and gas for well over half of its energy needs and imports are rising rapidly. To its credit the department indicates it plans to establish a new industry-led consortia-based program to develop a continued supply of natural gas beyond 2015. How can the department begin to con-

sider such an ambitious undertaking with such a minimal request? Why does the department effectively ignore research to address our natural gas supply needs that are acute now?

A8. Unfortunately, the Department will not be able to initiate this consortia-based program in natural gas since comprehensive energy legislation has not yet been passed. However, the Department recognizes the importance of natural gas production and is requesting funding to provide sound science for policy decision-making, and to enhance environmentally safe access to resources on federal lands, primarily in the gas-rich Rocky Mountain region. In addition, we recognize the importance of increasing supplies of liquefied natural gas (LNG) and are requesting funding to help provide answers to safety, environmental, and technology issues associated with the siting of LNG terminals.

Q9. **Energy Efficiency—***Deployment programs are considered to be some of the most successful in EERE. Long-standing programs such as Industries for the Future, Rebuild America and the Federal Energy Management Program provide real metrics for results from DOE research and development efforts. Yet, these programs have seen massive cuts to their budget.*

Q9a. Given the amount of energy resources that can be saved from even the smallest changes in industrial processes, how do you account for slashing the program budget by over one-third, especially in light of the President's recent commitment to domestic manufacturing?

A9a. We are asking these industries to bear a greater share of the effort in achieving energy savings which, after all, benefit the efficiency of their operations and enhance their own profitability. Over the past several years, the Congress has given us more funding than we have requested for the Industrial Technologies Program (ITP), and less than we have asked for to fund the low-income weatherization program. Low-income weatherization reduces energy use among low income Americans who spend a disproportionately high percentage of their income on energy. The ITP helps to reduce energy use among large industries that know how to save energy and have financial incentive and capital to do so. We have shifted resources to reflect the relative priority of these programs.

Q9b. Is the decrease in funds a sign that these programs may have reached the end of their useful life?

A9b. Industries of the Future, Rebuild America, and the Federal Energy Management Program (FEMP) are robust contributors to EERE's energy efficiency portfolio.

- *Industries of the Future:* As stated above, we are asking these industries to bear a greater share of the effort in achieving energy savings which, after all, benefit the efficiency of their operations and enhance their own profitability. Over the past several years, the Congress has given us more funding than we have requested for the Industrial Technologies Program (ITP), and less than we have asked for to fund the low-income weatherization program. Low-income weatherization reduces energy use among low income Americans who spend a disproportionately high percentage of their income on energy. The ITP helps to reduce energy use among large industries that know how to save energy and have financial incentive and capital to do so. We have shifted resources to reflect the relative priority of these programs.
- *Rebuild America:* Outreach and education efforts for Rebuild America will be consolidated in FY 2005 into a single outreach and communications office, increasing efficiency and lowering costs. In addition, the program has determined that less technical assistance is needed for certain mature and successful sectors.
- *FEMP:* As FEMP's core activities have matured, the efficiencies in those activities have increased, enabling the program to reduce its funding request in FY 2005. In FY 2005, FEMP will continue to streamline program activities. For example, FEMP has determined that it is no longer necessary, because of activity maturation, to create any new Technology Specific Energy Savings Performance Contracts (ESPCs). We have found that we can achieve the same benefits through a fuller utilization of our baseline ESPCs in a way that is less complicated for our agency customers. Through more efficient use of its resources, FEMP will continue to conduct its other activities, such as partnership meetings, annual awards, outreach publications and technical assistance projects.

Q9c. Is this indicative of the Department's approach towards deployment programs as a whole?

A9c. In total, we believe that our funding request for deployment activities is in alignment with previous requests, based on our estimates of allocation of program funding. Deployment activities comprise a critical part of the EERE portfolio because they help facilitate the market adoption of new technologies and energy sources. Without deployment activities, market barriers would delay or prevent the successful commercial adoption of certain EERE technologies that offer substantial energy security, environmental, and other benefits to the Nation.

Q9d. What are the metrics used to determine investment in deployment of such technologies?

A9d. EERE evaluates its investments based on the potential economic, environmental, and energy security benefits resulting from making energy-efficient products and renewable energy resources available to consumers.

Deployment activities can play a key role in facilitating the adoption of new technologies and energy sources. EERE focuses its deployment efforts on the removal of market barriers that make it difficult or impossible for certain technologies to penetrate markets. For example, the Rebuild America activity in the Building Technologies Program develops local markets for energy-efficient building retrofit services and markets.

Not all technologies or products face such barriers. EERE evaluates the benefits of technology development by considering how quickly they are likely to be adopted on their own (i.e., without federal assistance). In the cases where barriers make early or rapid market adoption unlikely, deployment options are assessed based on their potential to accelerate market adoption.

Global Warming

Q10. In your testimony, you described a number of programs that could lead to reductions in emissions of carbon dioxide. Witnesses have frequently told us that the Administration's policy is to stabilize carbon dioxide emissions. What is the Administration's position on when *it wants to stabilize carbon dioxide and* at what levels?

A10. As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), the United States shares with many countries its ultimate objective: stabilization of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous interference with the climate system. There are a number of unknowns regarding both climate science and technology, however, which pose significant challenges to meeting this long-term objective.

Among these is the uncertainty surrounding the timing and magnitude of the greenhouse gas reductions needed to meet the UNFCCC goal. Climate science has not advanced to the point where a "safe" level of atmospheric greenhouse gas concentrations can be elucidated with any confidence. This uncertainty was emphasized by the National Research Council in its 2001 report to the President on key questions in climate change science. It underscores the importance of the President's heightened emphasis on science and technology as the basis for future policy decisions on climate change.

To reduce uncertainty and predict future climate change with greater confidence requires major advances in understanding and modeling the factors that influence atmospheric concentrations of greenhouse gases and aerosols, as well as the feedbacks that determine climate sensitivity to a prescribed increase in greenhouse gases. The Climate Change Science Program (CCSP) strategic plan, released in July 2003, represents an unprecedented effort to advance our knowledge of the climate system. An extensive review of the CCSP plan by NRC concludes that the plan "articulates a guiding vision, is appropriately ambitious, and is broad in scope" and that "advancing science on all fronts identified by the program will be of vital importance to the Nation." In FY 2005, more than $2 billion is requested for climate change science.

The scientific information developed under the CCSP will help inform policy and define with greater precision the pace and scale of the technology challenge to address climate change. The Bush Administration's Climate Change Technology Program is working to develop technologies—such as carbon sequestration, hydrogen, bio-energy, nuclear fission, and fusion—that could fundamentally transform the way we produce and consume energy. Success in these activities will allow the development and commercial use of technologies that can, over time, decouple energy use from greenhouse gas emissions. Without these advanced technologies, it is difficult to see how the UNFCCC goal can be realized. Given the historical rate of technology

adoption, the inertia of existing energy systems, and the uncertainties inherent in advanced technology development, a gradual transformation toward low or near net-zero emission technologies is most likely. Should technologies advance more rapidly than expected, early adoption and accelerated modernization of capital stock could be possible. In FY 2005, more than $2 billion is requested for climate change related technology research, development and demonstration.

The Bush Administration also recognizes that while climate change is a long-term challenge, we must begin to address it now. Two years ago, President Bush set an ambitious national goal to reduce the greenhouse gas intensity of the U.S. economy 18 percent from 2002 levels by 2012. This new approach focuses on reducing the growth of GHG emissions, while sustaining the economic growth needed to finance investment in new, clean energy technologies. It sets America on a path to slow the growth of greenhouse gas emissions, and—as the science justifies—to stop and then reverse that growth. The Administration proposes more than $4 billion in tax incentives over the next five years to spur the use of clean, renewable energy and energy-efficient technologies. The Department of Energy's Climate VISION program and EPA's Climate Leaders and SmartWay Transport Partnership programs work with industry to accelerate use of cost-effective technologies and practices that improve efficiency and reduce emissions. Internationally, the United States has 13 bilateral agreements with key industrial and developing countries-representing about 70 percent of global greenhouse gas emissions-on advanced energy technologies, climate monitoring and modeling, climate research, Earth observation systems, and more. Further, we are supporting the U.N.'s Global Environmental Facility to transfer advanced energy and carbon sequestration technologies to developing countries.

Fusion Siting

Q11. **Fusion Siting—***Although the U.S. is now participating in the ITER fusion program, the international participants seem to be having trouble deciding whether to site the facility in France or Japan. Press accounts indicate that political divisions over the Iraq war are behind this fight over fusion. Allegedly the U.S. is supporting the site of our "ally" in Iraq (Japan), while those generally opposed to the invasion (Russia, China) are supporting France.*

Q11a. Is that true?

Q11b. Whether it is or not, when do you expect a decision to be made on the ITER site?

A11a,b. The allegation is false. The U.S. decision to support the Japanese candidate host site of Rokkasho was based solely on technical considerations, including site characteristics, costs to the US and host commitment to the project.

At the December 20, 2003, Ministerial Meeting on ITER, the six ITER Parties agreed that the two candidate sites at Rokkasho, Japan and Cadarache, France/European Union are excellent sites. Neither Japan nor the European Union has lost interest in becoming the host site for the ITER project, and neither has budged from their position of being the best site. Such a situation is not uncommon in the first round of site negotiations among the highest level negotiators.

On March 12–13, 2004, the six ITER parties met in Vienna, Austria to discuss the outstanding technical issues surrounding the site selection decision. It is now the responsibility of the two host candidate sites to seek a resolution on the siting of ITER. The Japanese and European Union delegations are expected to meet in March 2004 to discuss next steps regarding their site proposals and how to proceed.

Appendix 2:

Additional Material for the Record

ACE American Council on Education
AAU Association of American Universities
NASULGC National Association of State Universities and Land-Grant Colleges

February 10, 2004

The Honorable Sherwood L. Boehlert
U.S. House of Representatives
2246 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Boehlert:

We write on behalf of the more than 2,000 higher education institutions represented by our associations to urge that you oppose the proposal in the President's Fiscal Year 2005 Budget to transfer funds for the Math-Science Partnership (MSP) program from the National Science Foundation (NSF) to the Department of Education. It is our belief that the current system, in which parallel and complimentary MSP programs exist and are funded at both the NSF and the Department of Education, is the most desirable and effective approach to address our nation's math-science education needs.

We strongly support the MSP program as it has existed at the NSF. In its current form, this program links top scientific researchers at colleges and universities to elementary and secondary schools in an effort to improve the quality of math-science education. As a competitive grant program administered by the NSF, money is only awarded to the highest quality proposals based upon technical merit and a comprehensive peer review process. Given the exceptional track record of the MSP program at the NSF, we have serious reservations about discontinuing it.

We are concerned that transferring the MSP program entirely to the Department of Education will fundamentally change the manner in which funds are distributed. The MSP program at the Department of Education is primarily a block grant program where funds are distributed to states on a formula basis. This would be a significant disincentive for the best researchers at our universities to continue to participate in this important program. Moreover, as currently constructed, NSF's MSP program focuses on the modeling, testing and identification of high-quality math-science activities whereas the Department of Education focuses on their dissemination.

We all share the same goal—providing a world-class science and mathematics education to elementary and secondary school students. The MSP program at NSF is a unique effort of proven effectiveness. We strongly discourage Congress from eliminating the NSF continued participation in this important program.

Sincerely,

David Ward
President, ACE

Nils Hasselmo
President, AAU

C. Peter Magrath
President, NASULGC

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February 9, 2004

Honorable Sherwood L. Boehlert
Chair, House Science Committee
United States House of Representatives
Washington, DC 20515
Fax: 202-225-1891

Dear Mr. Chairman:

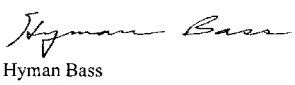
I am writing to express my deep concern over the proposal in the President's FY 2005 budget request to eliminate NSF funding for the Mathematics and Science Partnership (MSP) Program. I recognize that Congress created a parallel MSP program at the Department of Education, and that both programs have already had a positive impact on the improvement of mathematics and science education, both deserving of continuing, even increased, support. At the same time, the two programs have, by design, somewhat different orientations, the one at NSF being directed toward more innovative projects, with novel designs, or influenced by new scientific developments.

There are two fundamental, and compelling reasons why the NSF-based MSP Program should remain at the NSF. First, the NSF has a proven culture of rigorous expert peer review to assure the scientific quality and integrity of the funded proposals. Even when this system does not function perfectly, it has, within its culture, the capacity for appropriate correction, beyond undue political influence. No other environment for the MSP Program can provide such proven quality control.

The second reason derives from the very concept, and name, of the MSP Program. It is designed to build sorely needed partnerships between the scientific research communities and the world of K-12 education. There are few institutional structures that support substantial collaboration of this kind – indeed many impede it – so the MSP program provides a crucial incentive for these efforts. And, to this end, the NSF is the unique Federal environment that is both dedicated to and connected to basic science, and, at the same time, is a major agent in promoting improvement in mathematics and science education. NSF is uniquely qualified to implement the substance and the spirit of the MSP Program. So, from a policy perspective, it makes no sense, indeed it is almost perverse, to remove the MSP Program from its jurisdiction.

I urge you, and your fellow congressmen and women, to reverse this ill-conceived budget proposal. I know that all of my professional colleagues share this concern. I shall be happy to assist you in any way that I can in this effort.

Respectfully yours,



Hyman Bass
Immediate Past President, American Mathematical Society
President, International Commission on Mathematics Instruction

STATEMENT OF

DR. CHARLES CASEY, PRESIDENT, AMERICAN CHEMICAL SOCIETY

DR. DAVID EISENBUD, PRESIDENT, AMERICAN MATHEMATICAL SOCIETY

DR. CATHERINE A. PILACHOWSKI, PRESIDENT, AMERICAN ASTRONOMICAL SOCIETY

DR. HELEN QUINN, PRESIDENT, AMERICAN PHYSICAL SOCIETY

DR. JOHN STEADMAN, PRESIDENT, INSTITUTE OF THE ELECTRICAL AND ELECTRONICS ENGINEERS—USA

Mr. Chairman, Mr. Gordon and Members of the Science Committee, we thank you for the opportunity to submit this testimony. We also wish to express our appreciation for the strong support this committee has shown for science and technology over the course of several decades. The legislative actions this committee has taken during the last few years have raised the visibility of science and engineering substantially within Congress, we believe, to the great benefit of American society.

Sadly, we cannot provide such praiseworthy comments about the President's FY 2005 budget request for the physical sciences, mathematics and engineering. After a decade during which federal investments in these disciplinary research programs stagnated, with a consequential loss in purchasing power of 20 percent or more, the Administration's FY 2005 budget request does little to address the problem. Should Congress endorse the President's overall set of budgetary priorities and adopt the President's proposed funding levels for science, math and engineering, the decade-long decline will accelerate. It will place in even greater jeopardy America's science and technology leadership, already under increasing challenge by nations in Europe and Asia.

Discovery and innovation have been key to America's economic growth for more than half a century, accounting for more than half the increase in the GDP since World War II, according to economists. The impact of science and technology on our standard of living has become even more pronounced in recent years. As the Chairman of this committee noted last week, "We need to remember that the decade of unprecedented economic growth that began in 1992 and that lasted into this new century was a result of previous investments we had made in science and technology, particularly in areas such as information technology and the health sciences. If the current recovery is to be sustained, we need to invest now in R&D. A healthy investment in R&D is the only way to ensure that our economy will continue to create jobs over the long-term."

We would add to this several other observations. First, we can no longer take for granted the supremacy of American science and technology on the world stage that has served our nation so well for more than half a century. For a number of years, Europe and Asia have been investing heavily in their scientific infrastructure and their science education programs, and they are now challenging our nation's S&T leadership. Second, for several decades, we have relied heavily on a pipeline of foreign talent to bolster our scientific and engineering workforce. Heightened security policies in the aftermath of 9/11 combined with growing R&D opportunities elsewhere in the world are now causing many foreign scientists and engineers to rethink their choice of the United States for pursuing their education and career goals.

We believe that the President's budget request for the physical sciences, mathematics and engineering place the future of our nation at great risk, economically and militarily. The constriction in these federal accounts come at time when our nation faces significant R&D challenges. Sustaining real economic growth, as we have noted, requires continued investments in science that lead to discovery and innovation, according to many economists, among them Michael Boskin, Alan Greenspan and Robert Solow. In a risk averse, competitive global environment, where corporate time horizons are measured in months, rather than years, the Federal Government must be the dominant investor in long-term research.

The Federal Government also has the responsibility for keeping our nation secure. Science and technology are key to maintaining our military capabilities and keeping our homeland safe. The Defense Department increasingly looks toward civilian research programs for discoveries and innovations that can be translated into military hardware. The Department of Homeland Security also relies on the federal investments in long-term civilian research for advances that will lead to technologies needed in the war against terrorism on American soil.

The R&D enterprise also faces the challenge of making America energy self-sufficient. That challenge was captured in the Hydrogen Initiative proposed by the President last year. The elusive goal of weaning our nation off foreign sources of oil will

be achieved only through scientific discovery and innovation. Such investments must be made across the energy arena in the physical sciences and engineering, since it is impossible to predict where breakthroughs will occur.

Providing our nation with a high-tech workforce of world-class quality represents still another challenge for our nation's R&D enterprise. It is an essential component for keeping America competitive globally. As we already suggested, our nation is failing in that challenge. For more than a decade, we have witnessed a decline in the number of Americans seeking advanced degrees in the physical sciences, mathematics and engineering. To meet the shortfall, we have become reliant on a pool of foreign talent. We have reaped great benefits from the flow of scientists, mathematicians and engineers from other countries, but in the process, we have exposed our nation to the adverse consequences when the flow slows or stops.

Data on foreign applications to our institutions of higher learning suggest that the flow is indeed slowing. Entry into the United States has become more difficult, and nations, such as China and India, have invested in their scientific infrastructure, making it possible for many students to receive their training at home. Today, China and India also offer substantial career opportunities for scientists, mathematicians and engineers, opportunities that did not exist even half a decade ago. As Great Britain and Australia have increased their science and engineering recruitment efforts, they, too, have become significant destinations for young researchers from around the world. America's dominance of the science and engineering playing field is being seriously challenged.

High-tech American industry, which is global in character, has already recognized the opportunities that exist elsewhere and has begun to outsource some of its activities offshore. At the recent World Economic Forum held in Davos, Switzerland, John Chambers, Cisco Systems chief executive, made this point: "The jobs over time will go to the best educated places with the best infrastructure and the most supportive governments. How you create an environment where the jobs stay is going to be the key element." We believe that strong federal investments in basic research and the science and engineering infrastructure are prerequisite to a secure future for a high-tech American workforce.

Since the end of World War II, federal science and technology policy-makers have endorsed the concept of a multiplicity of agency support for long-term research. Today, the Department of Energy, NASA and the National Science Foundation dominate the federal civilian research portfolio in the physical sciences, mathematics and engineering. Collectively, these agencies have seen their budgets flat lined for more than a decade, during a time when the GDP has increased substantially and our nation's dependence on technology has grown commensurately. This investment approach contrasts sharply with the doubling of the budget of the National Institutes of Health that took place during the five years ending in FY 2003.

Congress recognized the policy imperative for addressing the portfolio imbalance and the shortfall in funding for the physical sciences, mathematics and engineering when it passed the *NSF Authorization Act of 2002,* which President Bush signed into law that December. The act authorizes the doubling of the NSF budget over five years. Both houses of Congress also agreed to authorize an effective doubling of the budget for DOE's Office of Science and included such language in H.R. 6. And on October 16, 2002, the President's Council of Advisors on Science and Technology (PCAST) strongly urged the White House to address the funding needs for the physical sciences.

Yet, the FY 2004 presidential budget request, which the President submitted last year, did not reflect any commitment to such an initiative. The FY 2005 request similarly ignores the policy recommendations and authorizations for the physical sciences, mathematics and engineering. The President's budget would cut funding for the DOE's Office of Science by 2.0 percent, and, once the Math and Science Partnership transfer is taken into account, it would only increase funding for the NSF's Research and Related Activities account by 2.8 percent. Collectively, the NSF's programs that cover the physical sciences, mathematics, computer science and engineering would increase by 2.2 percent, not enough to cover inflation. In the case of the DOE, the Presidential request provides no headroom for any congressional earmarks, which last year totaled almost $150 million, suggesting that overall spending on the Office of Science's research activities could fall even further, unless Congress alters the President's request.

Even at a time when the Federal Government faces large deficits, we believe that we must make the investments that safeguard the future of our nation. The President's proposed budget for the physical sciences, mathematics and engineering falls short of the mark in almost all cases. The NASA budget offers one exception, but even there the news is not uniformly good.

While the Office of Space Science is slated to receive an increase of just over four percent—which we applaud—we note that some of the programs not directly tied to the President's new "Exploration" initiative will be delayed or reduced significantly. The new "Beyond Einstein" initiative, for example, will have two of its key missions, Constellation-X (an X-ray spectroscopy telescope mission) and LISA (a laser interferometer mission) deferred under the President's plan, and other missions designed to study the high-energy universe will experience budget cuts or be eliminated. Likewise, severe reductions in some solar research programs could have long-term adverse effects on Earth-based installations and orbiting satellites, as our ability to predict solar storms ceases to improve.

On the positive side, we note that the new budget line entitled Lunar Exploration will allow further study of the lunar environment and enable the development of a sample return mission from the lunar south pole, where we now suspect water ice exists. We also commend the Administration for its budgetary commitment to improving in-space propulsion through the use of nuclear technology that will be needed if we are to explore the furthest reaches of the solar system.

Mr. Chairman, we conclude with a few comments about the context of the President's budget request for the physical sciences, mathematics and engineering. The White House press releases and the budget briefings have made it clear that for FY 2005, the Administration considered only a few activities to be of such national importance that they merited increases above the 0.5 percent baseline. These are defense, homeland security, education and space. (We have already commented on the NASA budget and will not dwell on that any further.)

We now consider proposed research budgets in the context of the other three priority areas. The history of the past half-century bears ample testimony to the importance of the physical sciences, mathematics and engineering for our military capabilities and for our extraordinary successes in defending freedom throughout the world. We have no doubt that our future defense capabilities will also be so reliant, as will our ability to defend our homeland against terrorism. In the case of education, we strongly believe that our 21st century workforce will become increasingly oriented toward science and technology. Recent analysis shows an extraordinary correlation between federal support for research and the number of American students willing to pursue careers in the sciences, mathematics and engineering.

In light of these obvious connections, we find it very disturbing that the President's budget request continues to under-fund research in the physical sciences, mathematics and engineering. We hope that the Science Committee concurs, and we urge you, Mr. Chairman, and Members of this committee to communicate our testimony to other Members of Congress. We hope that as the House of Representatives develops its budget plans for FY 2005 it will make the critical investments in physical science, mathematics and engineering research needed to foster our nation's continued leadership in economic and technological growth.